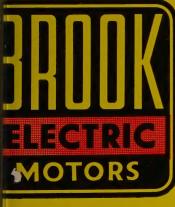
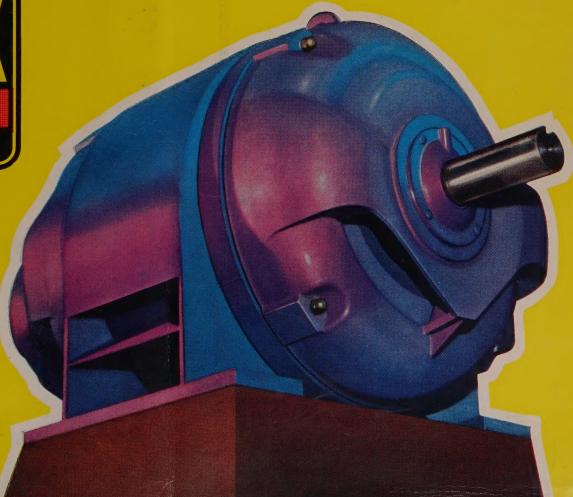
## ELECTRICAL REVIEW

25th to 600 horsepower





New lighting décor by



BENTAMIN Litemaste

Now...in one sweep... Benjamin brings new elegance in lighting to offices, entrance halls, restaurants and leisure areas. 'Litemaster' couples the proved efficiency and economy of 'Taskmaster' fluorescent fittings with outstanding contemporary design which, in addition to blending with any modern decorative scheme, offers new inspiration in the field of décor.

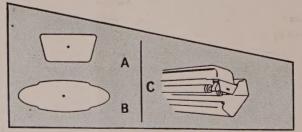
- \* Choice of style-A or B
- Choice of flush or recessed endplates
- Choice of endplates with or without sparkle holes
- Choice of endplate colour · Swan White Peony Red · Beacon Yellow · Anodised Gold
- Standard 'Taskmaster' channelling
- Ribbed acrylic plastic diffusers designed for instant access to lamps (C)
- Ceiling or pendant mounted

better lighting



by

BEN/AMIN



Four sizes:

1x4ft.40-watt lamp. 1x5ft.80-watt lamp. 2 x 4ft.40-watt lamps. 2x5ft.80-watt lamps.

Please send for illustrated teaflet

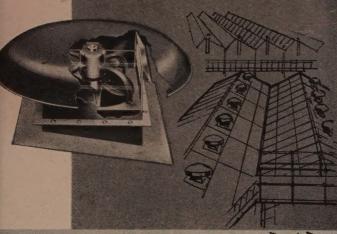
THE BENJAMIN ELECTRIC LTD . TOTTENHAM . LONDON N.17 Tel: Tottenham 5252 · Grams: Benjalect, Southtot London

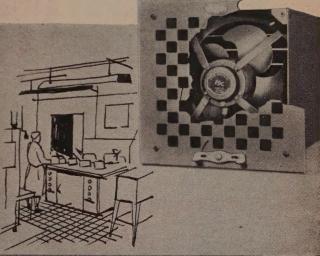
BIRMINGHAM: 5 Corporation Street • Tel: Midland 5197 LEEDS: 49 Basinghall Street · Tel: Leeds 25579

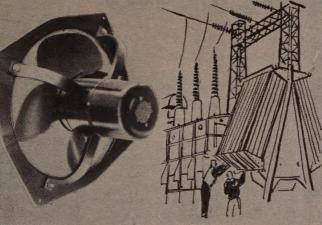
BRISTOL: Royal London Building, Baldwin Street · Tel: Bristol 28406

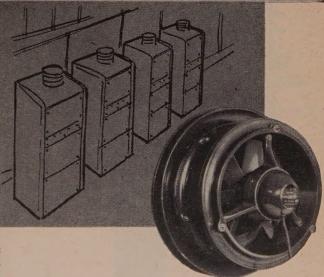
Smee's B157











. . . scientifically designed on advanced aerodynamic principles to ensure a steady unvarying movement of air unaffected by external conditions.

In addition to manufacturing standard ranges of fans, Fenton Byrn will always welcome this opportunity to consider and manufacture fans for special purposes. You are invited to submit your enquiries and proposals to the Fenton Byrn Research and Development Department.

FENTON BYRN & COMPANY LIMITED



## KARIBA at 330 kV.

All the bushing porcelains for the 330 kV. circuit breakers
All the 330 kV. strain insulators for the substations
and the 330 kV. post insulators for some of the substations
by

## **BULLERS**

MAIN CONTRACTORS · A.E.I. CO.
CONSULTING ENGINEERS · MERZ & McLELLAN.

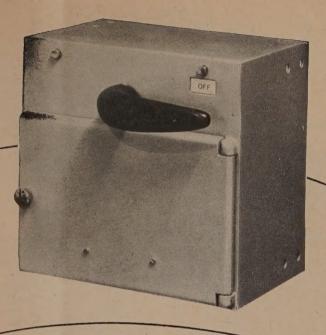


The illustrations show a complete 330 kV. bushing insulator and a 330 kV. circuit breaker, by courtesy of the A.E.I. Co.

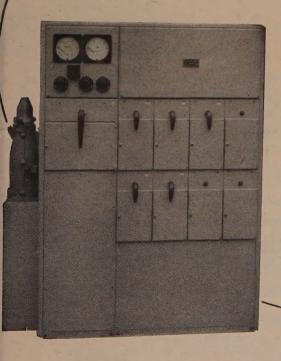
BULLERS LIMITED . MILTON . STOKE-ON-TRENT . STAFFS

Telephone: Stoke-on-Trent 54321

London: 6, Laurence Pountney Hill, E.C.4. Telephone: MANsion House 9971



## Take one box nine inches square...



This front handle operated, isolator or fused switch typifies the Varilectric range of switchboard components—adaptable and compact
Fuseboards, busbar-chambers, tap-off systems, etc., all have been designed with the same underlying principle: used together they form a compact switchboard 'tailor-made' to any location regardless of shape or size. Removable case and removable doors for ease of wiring are another feature.

Please write for further information of Varilectric Cubicle Pattern Switchboards to:-



MELON ROAD, LONDON, S.E.15.

Telephone: Rodney 6895/6/7



Open or enclosed construction up to 500 kVA

## SATURABLE REACTORS

## APPLICATIONS

Electric Furnaces · Servo Mechanisms Plywood Heating . Plastic Extrusion Vats and Dies • A.C. Voltage Stabilisation . A.C. Motors . Computors Calculators · Automation Systems Control of Air Conditioning and Heating Systems · Heavy Duty Battery Charging Control · Signals Control · Theatre Lighting, etc.



C-CORE OPEN

or Hermetically Sealed up to 1600 VA



SERIES 7002

Transformer/Chokes 5 VA to 1500 VA

OTHER TRANSFORMERS FROM THE HADDON RANGE



Power Transformers up to 100 kVA



SERIES 7003 Semi-Enclosed 10 VA to 250 VA

Saturable Reactors are available, open or enclosed, air or oil cooled, in over 60 sizes, to control powers up to 500 kVA. They are ideal for the stepless control of AC circuits of high power.

OUTSTANDING PERFORMANCE — Example: The amount of DC power required is as little as 20W to control the Haddon 10 kVA saturable reactor output from 3% to 95% of its full AC load.

## F HADDON 3

HADDON TRANSFORMERS LIMITED

VICTORIA PARK INDUSTRIAL ESTATE. FIELD END ROAD, RUISLIP, MIDDLESEX

Telephone: Byron 9444-8 Telegrams: Hadtrans, Ruislip SEMICONDUCTOR

RECTIFIERS

Milliwatts or Megawatts?

Germanium or Silicon?

AEI offers a

complete range of devices, assemblies, and power installations

## TYPICAL STANDARD RATINGS

		Max. Current
Silicon,	stud-mounted	2.3 amp
Silicon,	stud-mounted	10 amp
Germanium, fin-mounted 60 am		60 amp
Silicon, fin-mounted150 amp		

Standard potted units and stacks from 600 milliamp to 1500 amp. Complete power rectifier installations of any size for any application.

Write for technical data to:

Power Rectifier Sales
Heavy Plant Division

or

Semiconductor Sales
Electronic Apparatus Division
LINCOLN

RUGBY

AEI

Associated Electrical Industries Limited

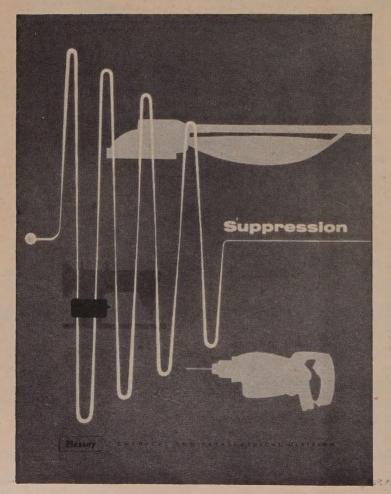
# on the subject of suppression

This new Plessey publication is designed to assist all those currently concerned with the problems of suppression of all electrical equipment.

The book provides Design Engineers with a standard reference to the complete range of suppressors produced by Plessey at Towcester, their individual suitabilities in application, their construction and their operational characteristics.

Many illustrations and dimensional diagrams are included.

Please ask for Plessey Publication No. 952.



## Plessey

COMPONENTS GROUP
CHEMICAL AND METALLURGICAL
DIVISION
THE PLESSEY COMPANY LIMITED
WOOD BURCOTE WAY
TOWCESTER, NORTHANTS
TEL: TOWCESTER 312

Overseas Sales Organisation:
PLESSEY INTERNATIONAL LIMITED
ILFORD ESSEX ENGLAND
TEL: ILFORD 3040

## MASIT

## TECHNICAL EXPERIENCE

We have been in the porcelain business for over ninety years, and for much of that time have been specialising in making insulators.

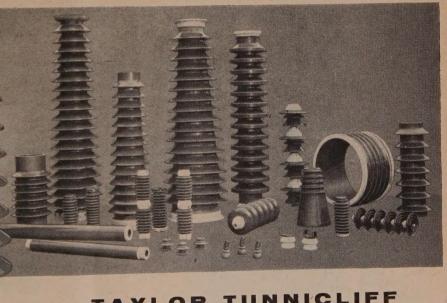
A vast fund of knowledge and experience now lies behind every item our factories produce. Continuing research and development daily increase the value of this background.

## PRODUCTION POTENTIAL

Three large factories, equipped with modern machinery and staffed by true craftsmen in the art of the potter, together provide enormous production potential, capable of dealing with the most difficult problems of porcelain insulation.

## RANGE

The range of porcelain insulators we can supply is exactly as wide as the demand, ranging from tiny, intricate die made products to the insulators required for transmission lines of the highest voltage in use today—or contemplated.



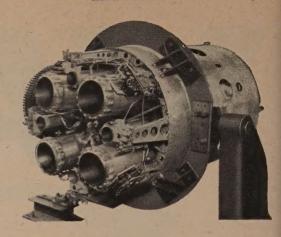
TAYLOR TUNNICLIFF PORCELAIN INSULATORS

POSITIVE PROOF ALL OVER THE WORLD



TAYLOR TUNNICLIFF & CO., LTD

Head Office: EASTWOOD, HANLEY, STOKE-ON-TRENT. Tel: Stoke-on-Trent 25272/5 London Office: 125 HIGH HOLBORN, LONDON, W.C.1. Tel: HOLBORN 1951-2



Research

## Vehicle engines use the Belleville Washer

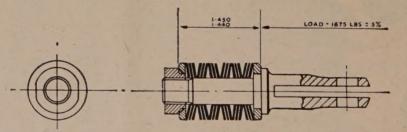
When the Black Knight Rocket roars 150 miles up into space it is guided by the swivelling through an angle of the four combustion chambers of the Gamma engine. An efficient damping mechanism is needed to prevent damage when the limit stop is reached.

Belleville washers provide the perfect answer to the problem.

Belleville washers are solving design difficulties in every industry—where resistance to exceptionally heavy loads is beyond the capacity of helical springs and particularly where movement under shock or sustained load must be restricted to very fine limits. Salter technicians can help you. Their services are freely at your disposal.

Photographs by permission

of Bristol Siddeley Engines





MAKE THE FINEST BELLEVILLE WASHERS



GEO. SALTER & CO. LTD., WEST BROMWICH, ENGLAND. Established 1760

## New...THORN PLUG-IN RELAYS

## **Thorn Pygmy Power Relay**



New interchangable relay designed for use in remotely controlled automation units. Has double pole changeover contacts. Dust proof-transparent plastic cover. Plugs into any standard International octal valve base. Weight Only 41 ozs ...

projection only 2" above base. Mechanical life over 10,000,000 operations.

Switching current: 5 amps maximum at 250 volts A.C.

Maximum surge current: 10 amps. Operate time: 8 milliseconds approx. Release time: 6 milliseconds approx. Overall dimensions:  $1\frac{3}{8}$  square by  $2\frac{9}{32}$ Coil voltage: 240 volts standard; also available for 6, 12, 24, 48, 60, 110 volts

## Thorn T9 Micro-Switch Relay

A plug-in relay, particulary suitable for switching P.A. equipment, the snap action contacts minimising interference with pick-up leads.

Operating coil wound for any specified voltage up to 240 volts A.C. or 150 volts D.C. May be tropicalised.

Up to three micro-switch pattern contacts mounted on standard coil frame.

Versions available with up to 11 solder tags or 10 screw terminals.

Contacts: 3 changeover.

Mechanical Life: Over 10,000,000 operations.

C/O Time: C.O. period less than 2 milliseconds.

Max. Switch: 10 amps/240 volts A.C. noninductiveload. 0.2 amps/240 volts D.C. "

Capacity:

0.5 amps/110 volts D.C. ,, 1.0 amps/50 volts D.C. ,, 5 amps/24 volts D.C. ,,

Max, Operate Speed: 20 cycles/sec.

Up to 0.1 amp. approx. 20 cycles/sec. Switching:

", 1 ", ", 5 ", 5 ", Frequency:





COMPONENT AND CONNECTOR DIVISION

Thorn Electrical Industries Limited, Great Cambridge Road, Enfield, Middlesex. Telephone: ENField 5353

Azoflex Equipment will be demonstrated on Stand No. B70

Instruments, Electronics and Automation Exhibition, Olympia May 23-28

## Rapid, high-quality photoprinting

The Ilford AZOFLEX Model 221 Combine printing and developing machine (formerly known as Model 42/63 Mark II) employs safe, odour-free AZOFLEX chemicals—just one of the many special features that make it the ideal photoprinting machine for print room or drawing office.

- Exposing, developing and drying operations completely synchronized.
- All controls accessible from comfortable
  - working position.
- High continuous output easily maintained by one operator.
- Excellent copies obtainable from old or faded
   originals.
- Comprehensive maintenance service available
  - at nominal cost.



## and no unpleasant fumes

Capacity: rolls and cut sheets up to 42 in. wide. Printing speed: 6 in. to  $15\frac{1}{2}$  ft. per minute. Lamp: H.P.M.V. MA/U 2,000 watt. Dimensions: height 50in., width 67in., depth (tray extended) 52in. Weight: 850 lb.

Subject to certain conditions, the majority of AZOFLEX photoprinting machines can be hired as an alternative to outright purchase.



## PHOTOPRINTING MACHINES & MATERIALS

Full details from

ILFORD LIMITED, INDUSTRIAL SALES DEPARTMENT AZ17F ILFORD, ESSEX. TELEPHONE: ILFORD 3000







SLIP-RING MOTORS up to 1000 H.P.

**GUARANTEED FOR EVER** 

AGENTS AND BRANCHES COVER THE WORLD

## It's the cooker for HER!

The Belling 48T is your customer's dream of a perfect cooker come true. We designed it after questioning thousands of women at exhibitions and demonstrations. It has been built to the highest specification, with a galaxy of easy-to-use and easy-to-clean features. So tell your customers about it and display it where it can speak for itself.

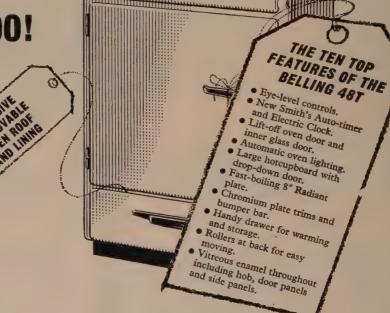
## **AND FOR YOU TOO!**

## **NO ASSEMBLY NEEDED**

Delivered complete with control panel already fitted and wired-no need for you to do any assembly work.

## **EASY TO INSTALL**

Simply remove the small inspection panel on the back to gain access to the mains terminals. No need at all to remove back or sides.

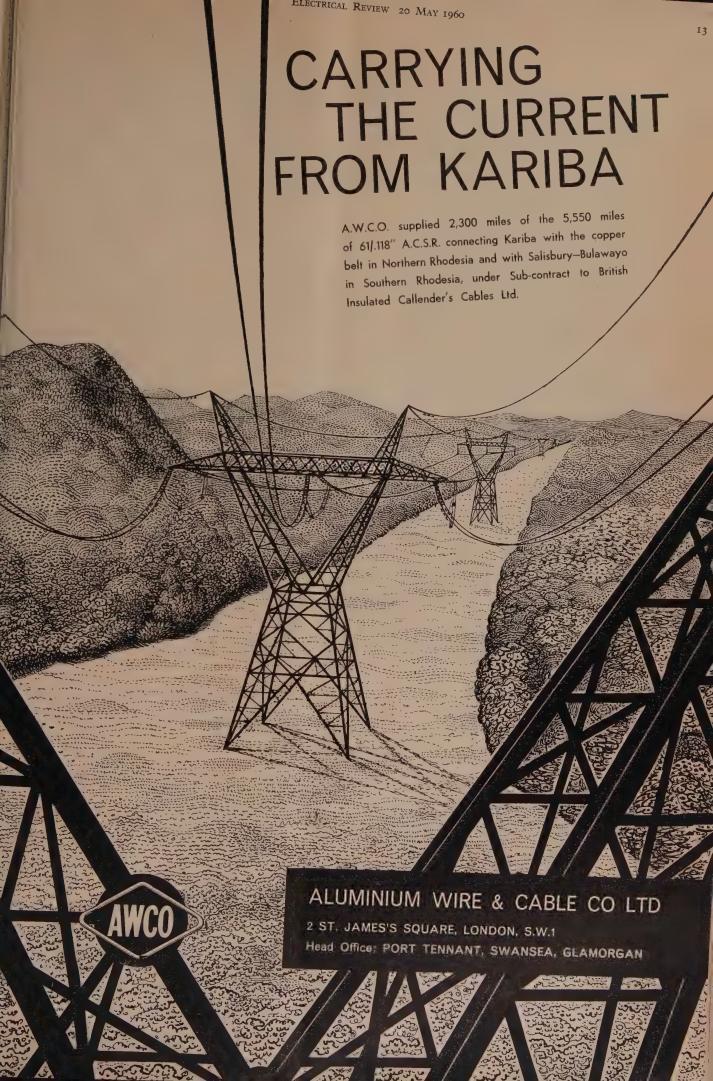


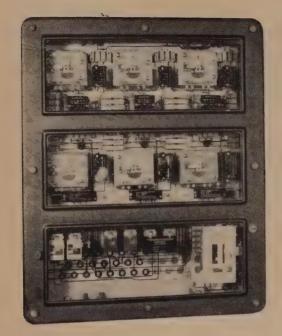


48T AUTO-TIMER £51

48 AB without Auto-timer £45, 15, 0

BELLING & CO. LTD., ENFIELD, MIDDLESEX, ENGLAND





## KARIBA

330-kV Transmission System Protected by Reyrolle Type-H Distance Protection

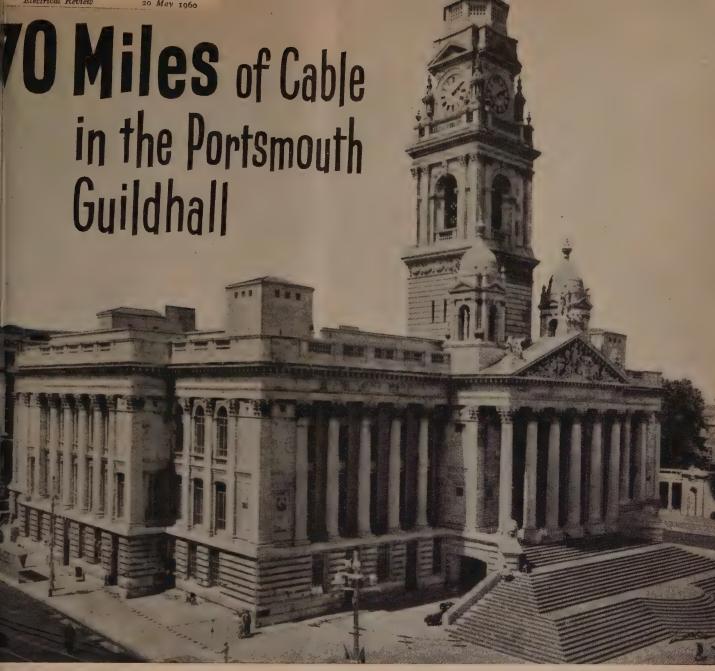


Reyrolle type-H high-performance distance protection incorporates the following important features:

- High speed for all types of fault
- Accurate measurement for exceptionally wide range of source to line impedance
- Negligible over-reach on D.C. transients
- Separate moving-coil elements for earth-faults and phase-faults
- All relay-elements identical and easily removable
- Self-contained design reduces panel wiring
- Built-in phase-selectors for single-phase auto-reclosing if required

Applied to major transmission lines throughout the world

## Reyrolle



Gutted by fire bombs in 1940 Portsmouth's historic Guildhall has now been rebuilt and the interior completely redesigned in modern style, making it one of the finest civic centres in the country.

Seventy miles of BICC P.V.C. cables were installed by Messrs. Grierson Ltd., of 140 Cromwell Road, London, S.W.7, for over two thousand lighting and socket outlets.

Other BICC cables used in this building include paper insulated cables for lifts, concert and conference halls, mineral insulated cables for rising mains, butyl rubber cables for the boiler house, and screened cables for the sound systems.

Architect: Mr. E. Berry Webber, F.R.I.B.A., 39 Gordon Square, London, W.C.I Electrical Consultant: Mr. H. A. Sandford, M.A., M.I.MECH.E., M.I.E.E., M.CONS.E., 2 Gate Street, Lincoln's Inn Fields, London, W.C.2



high speed deliveries of cables from stock WIRING CABLES
for every type of installation







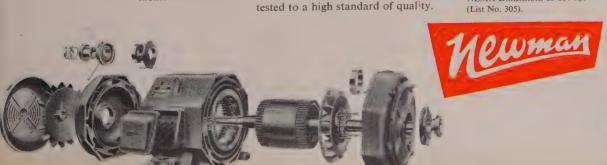


## Totally enclosed motors

Whenever a motor is required to give long reliable service in dusty, damp or dirty conditions it normally is a totally enclosed type. Newman pioneered the wider use of totally enclosed motors under such conditions and today the Newman range of these motors is able to meet almost every application in industry. Single or three-phase, foot, flange or face mounting, British or American dimensional and electrical standards, Class 'A' 'B' or 'E' insulation, motors with electro-magnetic disc brakes or built for close-coupled pump dutythese are some of the variations on the totally enclosed theme now available from Newman. All are built and tested to a high standard of quality.

- I TOTALLY ENCLOSED SINGLE-PHASE MOTORS British Standards 4-74 hp. (List No. 304).
- 2 TOTALLY ENCLOSED THREE-PHASE MOTORS British Standard Dimensions. ½-40 hp. (List No. 301). New NEMA Dimensions. ½-40 hp. (List No. 302).
- 3 TOTALLY ENCLOSED THREE-PHASE MOTORS British Standards 4-30 hp. (List No. 303).
- 4 TOTALLY ENCLOSED MOTORS With Double Air Circuit Cooling. British or American Standards. NEMA Dimensions 25-250 hp. (List No. 305).







## TH

## NEWMAN RANGE

Some of the other types of Newman motors available.



I DRIP-PROOF THREE-PHASE MOTORS British Standards. ½-175 hp. (List No. 101). New NEMA Dimensions ½-150 hp. (List No. 102).



2 DRIP-PROOF SLIP RING MOTORS British Standards 5-500 hp. (List No. 201). American Standards 5-500 hp. (List No. 202).



Drip-Proof or Totally Enclosed. Retarding torques 2.9 lbs. ft. to 144 lbs. ft. 16-40 hp. (List No. 801).



4 CLOSE COUPLED PUMP MOTORS British or American Standards. New NEMA Dimensions. ½-40 hp. (List No. 605).

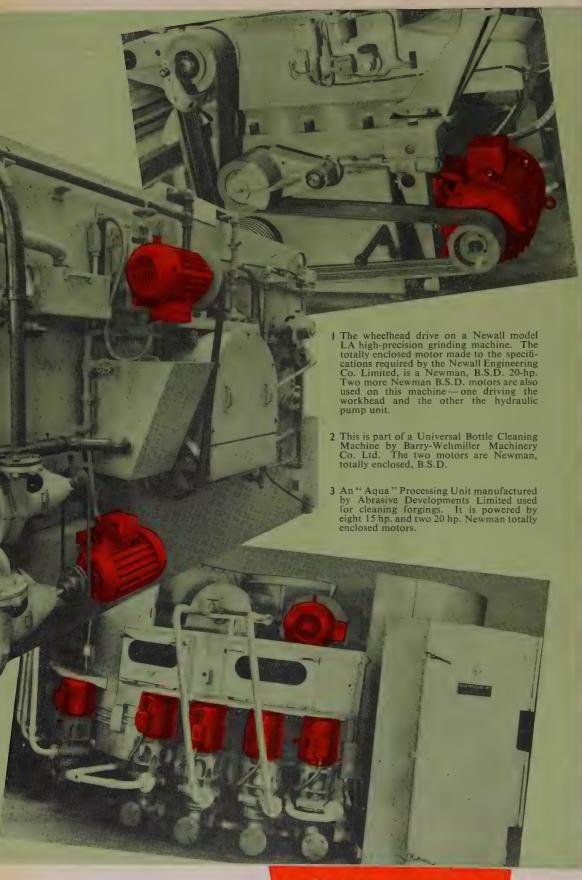


5 VERTICAL HOLLOW & SOLID SHAFT DRIP-PROOF PUMP MOTORS British or Amercan Standards. NEMA Dimensions. 10-300 hp. (List Nos. 602 & 604).



6 FLAMEPROOF MOTORS (Buxton Certified & Underwriters' Approved). British or American Standards. New NEMA Dimensions.

## Totally enclosed Motors at work



/Coom

NEWMAN INDUSTRIES LIMITED
YATE BRISTOL ENGLAND

Telephone: Chipping Sodbury 3311. Telegrams: Dynamo Yate. Cables: Dynamo Yate.

NOTTON mind
METER BOARDS

Use *proves* their superiority—made from carefully tested material, and ready to stand up to weather hazards anywhere, WOOTTON Meter Boards are the *best*—and that's the bear truth.

... and don't forget WOOTTON wood blocks, sunk switch boxes and instrument cases.

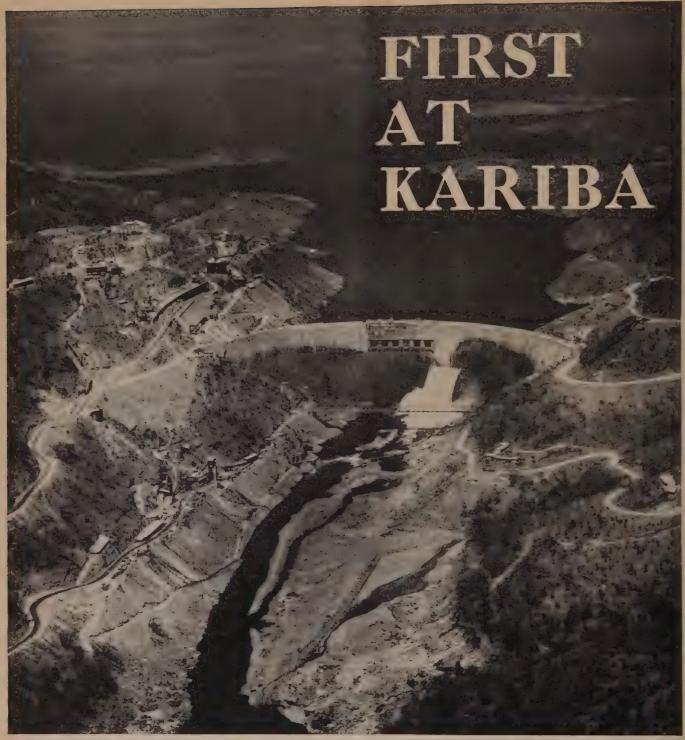
are the best!

Bear

WOOTTON & CO. LTD., ALMA WORKS, PONDERS END, MIDDX.

Telephone: HOWard 1858





Photograph by Fairey Air Surveys Ltd

In May 1952 a handful of men, all members of The Cementation Group, travelled to Kariba Gorge. Their task was to undertake exploratory drilling of three possible sites for the Dam  $\square$  They were the first to arrive... and since that time Cementation has been responsible for speedy civil engineering at Kariba totalling £3,500,000 in value. This work includes cofferdam foundations, the driving of the diversion tunnel, and cementation of structures both above and below ground  $\square$  The Cementation Group is proud to have participated in this mighty project.

## Cementation

THE CEMENTATION GROUP OF COMPANIES · 20 ALBERT EMBANKMENT · LONDON SE11 And in India, Pakistan, the Middle East, South Africa, Rhodesia, West Africa, Canada, New Zealand, Spain, Portugal and Brazil

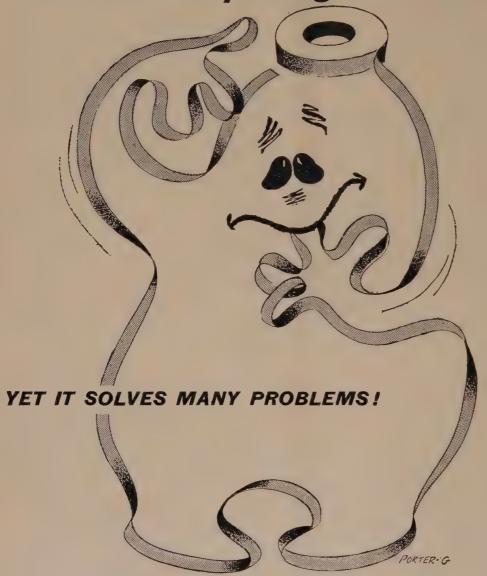
This new freezer-refrigerator, selling at 75 gns. (or at very reasonable terms for customers using the 'Allied'

Credit Plan, with no recourse to you) gives a higher-than-normal profit margin...

Write now for details



LASSO No. 92 PVC Electrical Tape can do everything but think—





Lasso No. 92 has so many properties, so many uses, we could fill this page with them. And dull reading it would make. A lot of stuff about pliability, water resistance, acid resistance, wrapping, jointing, insulating, binding, splicing — that sort of thing. Far better send for our alert young representative, he makes it sound interesting. Ask your secretary to drop us a line today.

SEND TODAY FOR OUR WALKIN', TALKIN', THINKIN' REP

## LASSOTAPES

for all electrical and industrial uses

SMITH & NEPHEW LIMITED . WELWYN GARDEN CITY . HERTFORDSHIRE



Quality in Nature, Sea-horse

## CRYSELCO

lamps and fittings can be obtained from any of fourteen branches and depots throughout the country.

All CRYSELCO business is based upon a policy of Quality and Service.

This attention to detail in production and distribution, coupled with more than 60 years' experience in lamp manufacture, ensures quality products, promptly delivered.

The range of lamps and fittings available is extensive. If you have not received the current catalogue, please send for one today.

## QUALITY and SERVICE

## CRYSELCO BRANCHES

are situated throughout the country.

Their aim is to give you quality products plus good service.

CRYSELCO Managers in the following towns and cities would be pleased to hear from you.



BEDFORD
BIRMINGHAM
BRISTOL
BURY ST EDMUNDS
CARDIFF
GLASGOW
LEEDS
LEICESTER
LIVERPOOL
LONDON
MANCHESTER
NEWCASTLE
NOTTINGHAM
SOUTHAMPTON

CRYSELCO LIMITED
KEMPSTON WORKS
BEDFORD

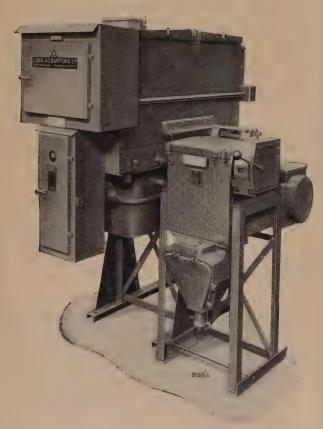


Service by Sea, Queen Mary

(Photo Cunard Steamship Co Ltd)



## OUTDOOR CIRCUIT BREAKERS



Off load oil isolators on both sides of Breaker.

Earthing of circuit through the Breaker. (Also bus-bar earthing if required.)
Full safety interlocks to prevent maloperation.

Circuit testing after earthing.

Built to line up with existing outdoor oil switches, etc.

Totally oil and compound insulated.

Breaking Capacity Rating — 250 MVA at 6.6 kV and 11 kV.

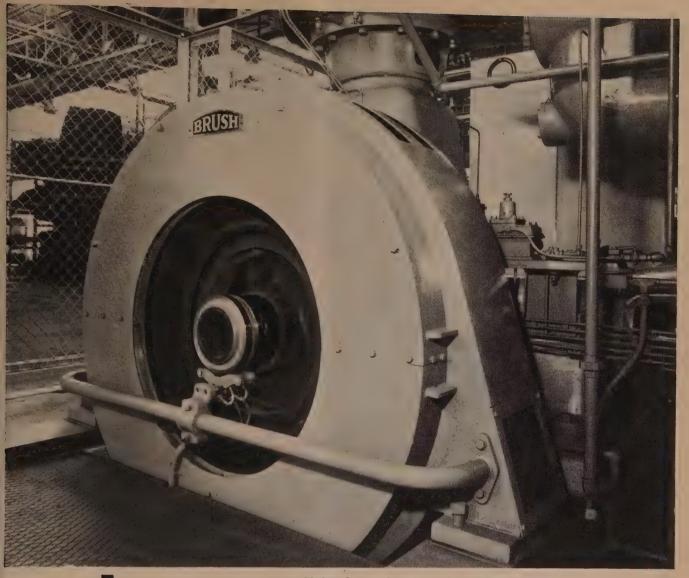
Impulse Tested.

6.6 kV to 11 kV 250 MVA

Illustrated is a type 'WPD2' Circuit Breaker connected to a type 'J' 400 amp Oil Switch.

## LONG & CRAWFORD LTD.

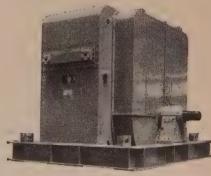
GORTON ROAD - MANCHESTER 12



Modern slow-speed compressor drive with overhung rotor.

Brush synchronous motors provide the most compact electrically driven compressor arrangement possible.

- Flywheel effect incorporated in motor - no other flywheel required.
- No bearings.
- Automatic starting.
- Static or rotary excitation and automatic static power factor control with cycling loads.



Totally enclosed water cooled motor for rubber mixer drive.



## ROTATING MACHINES



Stand Nay, 1960
Olympia, London

## Semiconductor devices and and metal rectifiers



Silicon power transistors and trinistors for control and power applications in a.c. and d.c. circuits.



Silicon diodes with outputs ranging from a few milliamperes to hundreds of amperes at up to 1000 volts p.i.v.



Low priced miniaturised selenium assembles using double—or quadruple—voltage elements for control circuitry.



Low self capacitance selenium rectifiers for gating circuits.

Write for details to Dept. E.R.11 Rectifier Division.

WESTINGHOUSE BRAKE AND SIGNAL CO. LTD.

82 York Way, King's Cross, London, N.1.

TERminus 6432

## Protect your Equipment with these Miniature Components

## 屋一丁一鱼

## CURRENT OVERLOAD PROTECTION



E-T-A Thermal Overcurrent Circuit Breakers.

Maximum Voltage Rating

24 V. D.C.

Current Range

Minimum 0.05 Amps. Maximum 25 Amps.

precision built miniature breaker which will absorb surge currents and protect circuits at rated currents. An extremely wide range of ratings are available, as well as various designs, including auxiliary circuit and dual voltage connections.

See our entalogue section 1/52.

E-T-A Thermo Magnetic Overcurrent Circuit Breakers.

Maximum Voltage Rating

Current Range
Minimum 0.05 Amps.
Maximum 15 Amps.

This extremely compact unit offers protection against the whole range of possible fault conditions and instantaneously trips short circuit currents. Can be supplied with auxiliary circuit and dual voltage connections.

See our catalogue 2/57.

The above units are suitable for use with electrical and electronic equipment, telecommunication apparatus, small transformers, rectifiers, fractional H.P. motors, domestic appliances, etc., and are only part of our wide range of low voltage D.C., single phase A.C. and 3 phase breakers. We also supply starter winding switches, snap action motor protection relays, thermal cut-outs, etc.



Please write to us for our catalogues or any technical information you may require with regard to your own circuit protection problems.

TECHNA (SALES) LTD. 47 WHITEHALL, LONDON, S.W.I

Telephone: Whitehall 1348/9

INSTRUMENTS, ELECTRONICS and AUTOMATION **EXHIBITION STAND Q746** 



## for superior insulation

Like many other RUBEROID products, its quality far exceeds the requirements of the British Standard (No. 1078/1954). P & B tape protects cable in power houses, transformer stations, telegraph and telephone installations, mines—in fact wherever exceptional resistance to abrasion is essential. When you need the supreme heavy duty insulating tape, take P & B, in widths from  $\frac{1}{2}$ " to 3".

Take Ruberoid bituminous products for weatherproofing and insulation.

Manufactured by



Write for the complete list of RUBEROID bituminous products

THE / RUBEROID COMPANY LIMITED 92 COMMONWEALTH HOUSE, 1-19 NEW OXFORD STREET, LONDON, W.C.I



## HIGHEST ELECTRICAL STANDARDS COMPLIED WITH

Illustrated

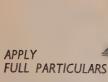
LIST No. 70 ½" BIT POSITIONED IN THE ADCOLA COMBINED PROTECTIVE SHIELD LIST 700

FOR CONTINUOUS BENCH LINE PRODUCTION

SUPPLIED
IN ALL VOLT RANGES
AND
A DESIGN FOR EVERY
PURPOSE IN THE
MINIATURE SOLDERING
INDUSTRY

The
instruments
with the
correct
soldering
temperatures

British and Foreign Pats.
Registered designs etc.



ADCOLA PRODUCTS LTD.
HEAD OFFICE

GAUDEN ROAD, CLAPHAM HIGH ST.,
LONDON, S.W.4

Telephones: MACaulay 4272 & 3101

Telegrams: "SOLIJOINT," LONDON

## REFLECTOR SPINNINGS

to your designs



## **STOCKFIELD**

MANUFACTURING CO. LTD.

Morcom Road · Greet Birmingham | |

Telephone Acocks Green 2931



The Stator of a heavy duty motor being wound with Lewkanex in the works of Baldwin & Francis Ltd., Sheffield.

## LEWKANEX

## THE high temperature WINDING WIRE

The introduction of the polyester type of covering has the particular advantage of exceptional thermal stability. The enamel film on Lewkanex wires is based on a terephthalate polyester and thus combines improved heat-ageing qualities and has a useful life at much higher temperatures.

Lewkanex wires meet all the requirements of B.S.1844 and are offered in the size range 0.004" to 0.080".

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED

· E10

With **Automatic** 

Re-set

## SYNCHRONOUS TIMER

SHADED POLE MOTOR



Range of Speeds from 3000 r.p.m. - 1 r/24h.

## SYNCHRONOUS MOTOR



With Gear Box TYPE 392

High Torque. Range of Speeds 600 r.p.m. -1r/24h.

## Eleven different models are available (½ sec. min. - 26 h max.)

## **IMPULSE SWITCH**



EXHIBITION OLYMPIA





STAND 861 I.E.A.



(Single, two or three pole) Type 621.300.



**TYPES** 343 and 700

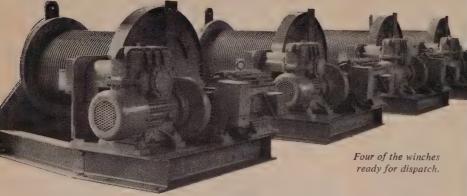
SEQUENCE



A.F.S. DEVELOPMENTS 9 Church Road, Richmond, Surrey

Telephone: RIChmond 6757

## For the supreme test



## L-E-F ELECTRIC WINCHES

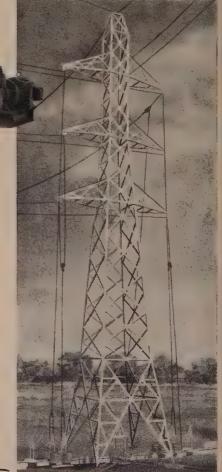
For the recently modernised Tower Testing station of Painter Brothers Ltd., at Hereford-probably the most up-to-date in the world—a battery of six dual-speed Electric Winches was specially designed and supplied by London Electric Firm.

L.E.F. winches were selected because they are precision-built and completely reliable under all conditions. They are used for big jobs and small by the great names in British industry. Take your winch problem to:



## LONDON ELECTRIC FIRM LIMITED.

Brighton Road, South Croydon, Surrey Telephone: Uplands 4871

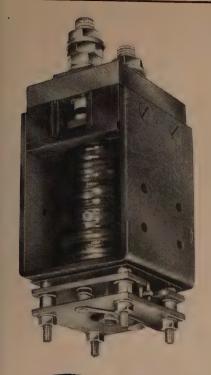


full protection against costly motor burnouts under all conditions

WRITE FOR DETAILS TO GEORGE ELLISON LTD PERRY BARR BIRMINGHAM 22B



C. A. PARSONS & CO. LTD. · HEATON WORKS · NEWCASTLE UPON TYNE



## DC SOLENOID CONTACTOR

## TYPE CF 150

- ★ CURRENT CAPACITY 150 amps continuous at 2 lbs. pressure per contact.
- LOAD BREAKING CAPACITY 250 amps. at 24 volts. Higher voltages proportionately depending upon load
- HIGH TEMPERATURE INSULATION Used throughout the construction.
- \* ARC CHAMBER AND MAIN CONTACTS Designed to promote rapid acceleration of the arc when contacts open. The arc is blown outwards and extinguished at the two ports provided.
- ★ DOUBLE BREAK SILVER AUXILIARY CONTACTS
- COIL DATA

Layer wound with wire having high temperature enamel insulation. Lapped finish using high quality tape and vacuum impregnated. Full tropicalisation if

36 volts standard, other voltages to order. 18 watts at 36 V. 16°C.

ableform Ltd

ROMILEY CHESHIRE

Phone: Woodley 2246 PBX. Grams: "Noflash" Romiley

BRANCH WORKS: LONDON ROAD, MACCLESFIELD, CHESHIRE

Tel.: Macclesfield 4946 A.I.D. & A.R.B. APPROVED

## Relays

Single relays, each up to triple pole, are available in Buxton certified flameproof form. Mercury switch relay units of



I to 6 stages can be supplied, covered by Certificate I.S. 3007 for the Hydrogen and Pentane classes; Certificate I.S. 1100 applies to single stage units for Methane.

## **Pressure Switches**

Most types of Pressure Switch in our list 119/G can be supplied in Buxton certified flameproof form.



## Air Flow **Switches**

Type AFS/FP, a switch to operate contacts on failure of air flow is Buxton certified for Groups I, II and III.



## **Level Controls**

Floatless units based on our 'Lectralevel' system (List 94/F) are available with Buxton and I.S. Certificates.





and Intrinsically Safe electrical equipment

Where requirements call for FLP or I.S. electrical controls you will find the answer in the Londex range. (All approved by the appropriate authorities and complying with BSS 229 & 1259 where applicable.)

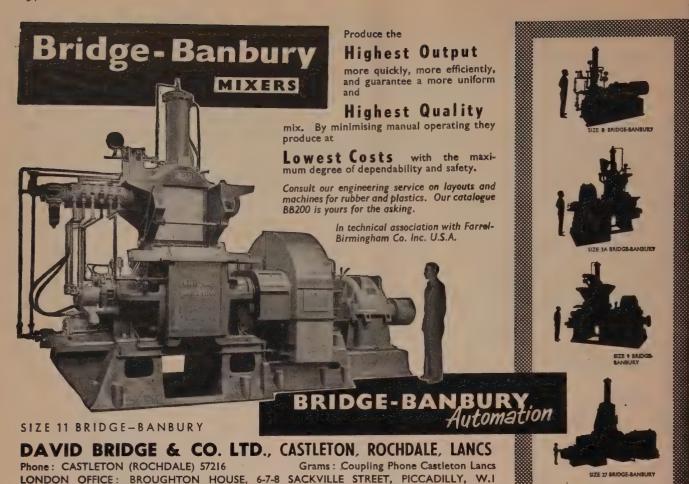
Process Timers Also available in FLP form.

LONDEX LTD.

Manufacturers of Automatic Electrical Control Equipment

ANERLEY WORKS, London, S.E.20 Tel: Sydenham 3111 (5 lines)

Phone: REGENT 7480





Grams and Cables: "EDERACEO" Piccy London

THE MIDLAND DYNAMO CO. LTD.
QUICKWAY WORKS - LEICESTER - Tel. 20172 (5 lines) Grams: "DYNAMO" LEICESTER





# No ordinary engine this!

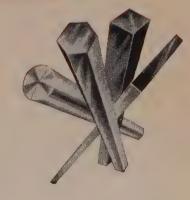
# —it incorporates Low Moor Steel



Fullest details of Alloy & Special Steels and Super Hiperm on request from Low Moor Alloy Steelworks Ltdl

For details of Steel Extrusions contact Low Moor Fine Steels Ltd.

... Alloy and Special Steels by Low Moor ... Steels of superb quality, often specified by world-famous Aircraft and Aero Engine Manufacturers. These steels are A.I.D. and A.R.B. approved and are part of a whole range of Steels produced after years of research and development, thus ensuring superb quality under all conditions.



LOW MOOR

ALLOY STEELWORKS LIMITED

Low Moor, Bradford

Tel: 77331 (9 lines)



#### **TRANSFORMERS**

All the sub-station transformers for the Kariba Hydro-Electric Scheme are being supplied by Ferranti Ltd. They comprise two 120,000 kVA, 330/234 kV 3-phase auto transformers with series boosters, eight 60,000 kVA, 330/88 kV and four 60,000 kVA, 330/33 kV 3-phase double wound transformers. The transformer installations at Norton, Lusaka and Kitwe are complete. Work at Salisbury, Bulwayo and Sherwood is well advanced.

# SUMMATION METERING

For the same scheme Ferranti Ltd. are supplying Summation Metering Equipment comprising: Precision grade integrating meters, Electro - mechanical summators, Printometer Demand Recorders and Suites of metering cubicles. These equipments will be used to meter six 100 MW generator sets at Kariba Power Station and also the supplies to the Transforming Stations at Kitwe, Norton, Salisbury, Lusaka, Sherwood and Bulawayo.

The consulting electrical and mechanical engineers are Messrs. Merz & McLellan.

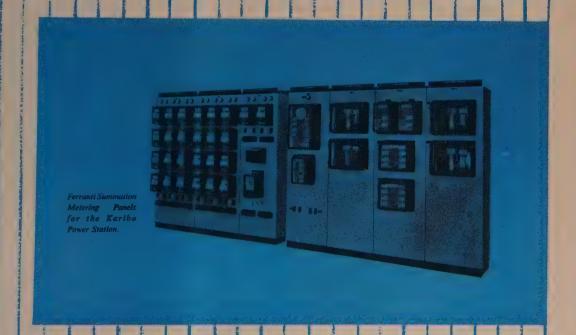


FERRANTI LTD . HOLLINWOOD . LANGASHIRE Tol: FAllsworth 2000



One of the two Ferranti 120,000 kVA 330 | 234 kV auto transformer and series booster installations at the Kitwe substation.

# FERRANTI AT KARIBA



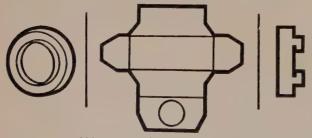
London Office: KERN HOUSE · 36 KINGSWAY · W.C.2 Tel: TEMple Bar 6666

### plastic mouldings



We produce plastic mouldings for very many industries including The Admiralty, Electrical Engineering, Motor Trade, Electronic Instrument Manufacturers, Holloware and Domestic Appliance Manufacturers. Mouldings can be produced in any colour from a wide selection of materials to meet all requirements for High Electrical, Waterproof, Heat Resistant or Shockproof properties. All products have an excellent finish, free from scratches or flashings, being individually examined before dispatch.

#### MICA & INSULATING MATERIALS



Write for fully illustrated literature

THE BIRMINGHAM MICA COMPANY LIMITED

3 South Road - Hockley - Birmingham 19 Telephone: NORthern 5631

# TYSWITCH



### ensure foolproof contact

Versatile and reliable, Keyswitch relays set the standard for design, robustness, sensitivity and extremely efficient operation -even under the most hazardous operating conditions.



The relay illustrated above has been built for heavy and light duty performance. It incorporates 15 amp. Micro Switch, 5 amp. Mercury Switch and Standard 0.3 to 8 amp. contacts.

RELAYS FOR ALL PURPOSES can be supplied to customers' requirements.

AUTOMATION COMPUTERS. BATCH COUNTING and PHOTO-ELECTRICS, TELEPHONY and INTERCOM. SYSTEMS, AUTO-TIMING and AUTOMATIC SIGNALS, MOTOR and MACHINERY CONTROL, CURRENT and VOLTAGE REGULATION, etc.

#### CONTACT KEYSWITCH

Extremely advantageous quotations can be offered for quantity orders

Sales Director
FOR IMMEDIATE DIRECT SUPPLY 2 Irongate Wharf Road, Praed Street, London, W.2 Tel.: PADdington 2231

Contractors to Home and Overseas Governments and H.M. Crown Agents

# Alcho-Re Flux

promotes solder spread

and eliminates

corrosion

Alcho-Re fluxes conform to specification D.T.D.599 and R.C.S.1000 and are approved by D.G.I., A.R.B. and G.P.O.

In laboratory and production tests Alcho-Re fluxes are proved to increase solder flow, speeding soldering times and cutting costs.

Alcho-Re fluxes in paste or fluid form, are completely non-corrosive. They cannot attack solder or base metal and eliminate the dangers of dry or H.R. joints.



Plain resin flux restricting solder flow.



SOLDER Spread is increased with the positive fluxing action of ALCHO-RE.



CORROSION note the completely inert Alcho-Re residue after 3 months storage.

**ELIMINATES** 



DANGEROUS CORROSION The residue from an active flux caused this corrosion after only 3 days.

# Metal Foundries Limited

ANDEM WORKS, MERTON ABBEY, LONDON, S.W.19 Telephone: Mitcham 4023 (7 lines)

Ind at MANCHESTER

GLASGOW

KIDDERMINSTER

**DUBLIN** MRP.98



# FERRANTI

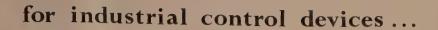
# STAND No. N604

Atthe I.E.A. Exhibition Olympia
May 23-28

Phase-Earth Loop Impedance Tester · Disturbance Recorder · Summation Metering · Indicating & Industrial Instruments · Viscometers · Silicon Semiconductor Devices · Industrial Valve & Cathode-Ray Tubes · Ceramic-Metal Seals · Argus Transistorised Process Control Computer · Electronic Devices · Precision Potentiometers · Small Transformers · Machine Tool Control · Gyroscopic Equipments · T.R. Cells · Microwave Ferrite Devices, Components and Materials.

FERRANTI LTD. Head Office and Works: HOLLINWOOD • LANCS
Tel: FAllsworth 2000

London Office: KERN HOUSE . 36 KINGSWAY . W.C.2. Tel: TEMple Bar 6666



- SWITCHES
- INDICATORLIGHTS
- MINISWITCHES
- METALCLAD MINISWITCHES
- PUSH BUTTONS
- ROTARY
  SWITCHES

A RANGE OF QUALITY
CONTROL GEAR
BUILT TO SATISFY THE
DESIGNER AND ENGINEER



CATALOGUE GIVING
FULL DETAILS & PRICE
LIST AVAILABLE ON
APPLICATION

.. consult

CRAIG & DERRICOTT

Telephone: SUTton Coldfield 7716-7-8

ROYAL WORKS, SUTTON COLDFIELD

# Complete Instrumentation

- PERMANENCE OF CALIBRATION
- ACCURACY OVER A WIDE LOAD RANGE
  - LONG SERVICE LIFE
  - LARGE-**FIGURE** REGISTERS AVAILABLE

The range includes single-element meters, two and three element polyphase meters, two-rate polyphase meters and elapsed time meters

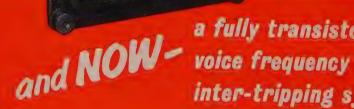
'ENGLISH ELECTRIC' meters. relays and instruments are made to the highest standards in a special clean-air factory. The entire range, covering all applications

240° INSTRUMENTS (moving coil, moving iron and dynamometer)

> MINIATURE INSTRUMENTS (moving coil and moving iron)

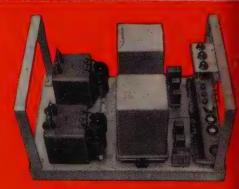
TRACTION INSTRUMENTS (moving coil) Shock and vibration proof

Switchboard instruments are available in round or square cases with 4", 6" and 8" dials. Miniature instruments can be supplied in seven case types. Edgewise instruments are included in the 'traction' range.



a fully transistorised inter-tripping system

Costing approximately half that of conventional equipment, this power systems protection link is suitable for many applications on rented telephone circuits—Easy to install—Requires no maintenance—Small power consumption.





# and protection

n and protection on electrical stems, has a family likeness

VISIT STAND E215

at the INSTRUMENTS **ELECTRONICS** and **AUTOMATION** Exhibition Olympia, London, May 23-28

- RELIABILITY
- **ACCURACY**
- EASY MAINTENANCE AND TESTING

'ENGLISH ELECTRIC' relays are highly standardised, using only three basic movements for the majority of applications.

All relays are available in projecting or flush pattern draw-out cases.

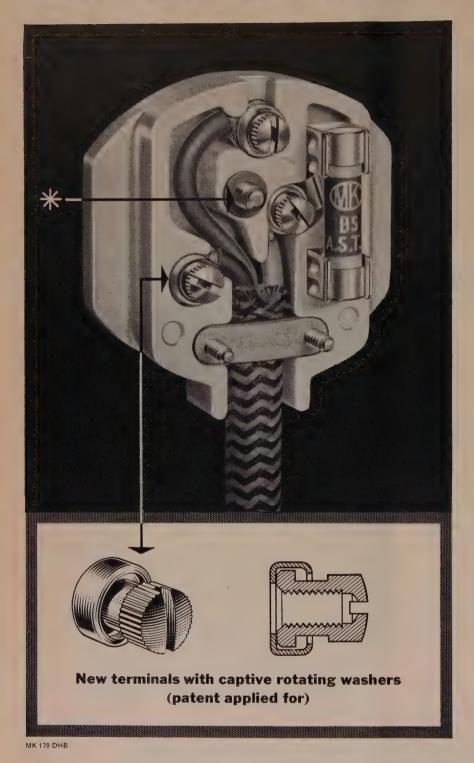


# ENGLISH ELECTRIC

meters, relays and instruments

HE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2 Meter, Relay and Instrument Division, Stafford works: STAFFORD PRESTON RUGBY IN TOWNS LINEARLY

# FURTHER ADVANCES IN 13 AMP.



# PLUG DESIGN

(BS1363)

New terminals with captive rotating washers! Atremendous advance—speeds wiring and ensures that washers are not lost or forgotten.

\*Cover screw now captive with the plug body cannot be lost and saves handling time. "Shakeproof" spring washer (also captive with the screw) ensures a firm and non-loosening fixing.

\* \* \* \*

Extended finger shields give maximum protection for the fingers whilst providing a firm and natural grip.

"One Piece" plug pins and terminals permanently secured to the plug body. Stranded conductors easily and quickly wrapped around non-rotating terminal studs. A secure and efficient connection without the danger of cutting the conductors as likely with some "Pinching Screw" type terminals.

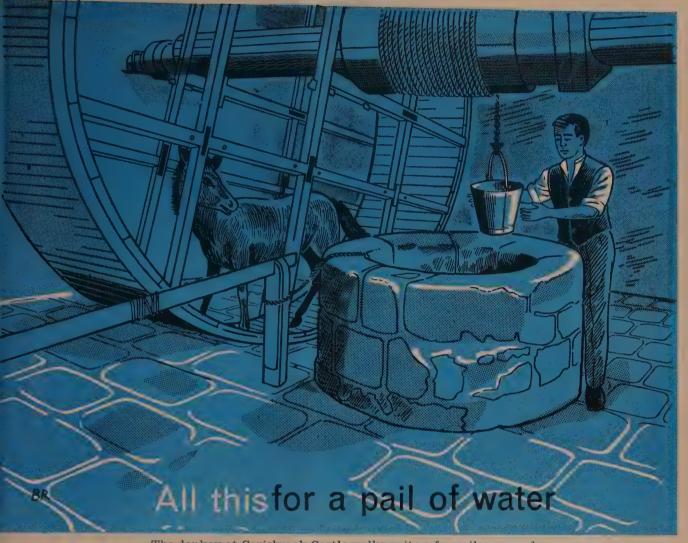
The M.K. Cartridge Fuse-Link (ASTA certificate of rating has been obtained) is secured in integral silver-plated contact clips for minimum contact resistance and low temperature rise. Enclosed within the plug for absolute safety yet quickly replaced by a twist of the captive cover securing screw.

Plug cover and body are track-resisting mouldings.

### FOR LEADERSHIP IN 13 AMP. PLUG DESIGN



Send for leaflet 255



The donkey at Carisbrook Castle walks quite a few miles every day without ever getting anywhere, but his work is anything but futile. Faced with the problem—an extremely deep well—when pumps and pipes were pretty primitive this 'donkey engine' was a fair solution to the problem of raising water.

Today, when the problems are so much more complicated the solution is often much simpler—get in touch with Varley's. If your problem is pushing, pulling, punching, prodding, at a distance or automatically, the answer, proved many times in many fields, is a Varley Solenoid.



# solenoids

Type 'V' (Illustrated)

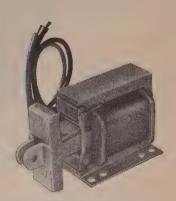
This is the smallest of the Varley range of laminated solenoids. It features a vacuum-impregnated coil and all ferrous parts are plated and passivated. The captive plunger has a controlled stroke of  $\S$ ".

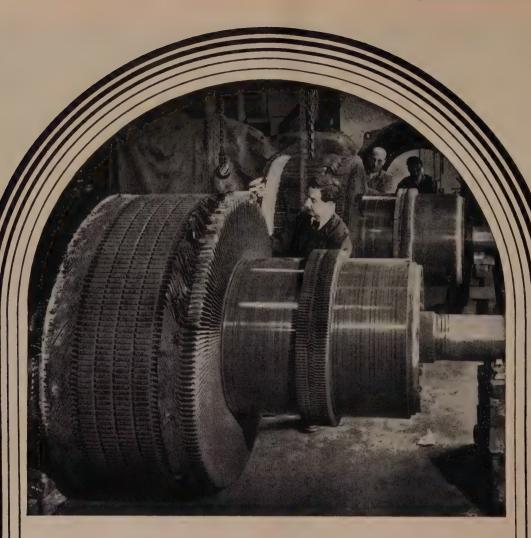
For full details of Varley Solenoids, write for Illustrated Catalogue T1/2

### OLIVER PELL CONTROL LTD

Cambridge Row, Burrage Road, Woolwich, S.E.18

Woolwich 1422 (5 lines). Telegrams: Olipel, London, S.E.18.





Engineers' Language! For every Plant Engineer who swears at Collins, there are ninety-eight and a quarter who swear by them. Engineers being engineers, this is quite something. As we were saying, we show two 1500kW 240-volt 600 r.p.m. D.C. Generators, one being stripped out for rewinding, t'other being rewound.

# COLLINS

Collins Electrical Ltd.

Head Office 115 Clerkenwell Road London EC 1
Central London Works
22 St. Albans Place Upper Street Islington N 1
West London Works

9 & 11 Featherstone Road Southall
Phone Holborn 0212-4 Canonbury 3227-8
or Southall 0168

# all the cable at Hunterston

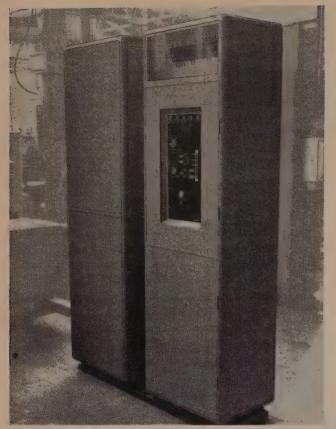
is PS

19,500 yards of Pirelli-General 132 kV. single-core oil-filled cable are being installed between the transformers at the power station and switching station. The insulation of this cable is designed for 110 kV/cm, maximum working stress.

With the completion of this installation the whole of the cabling at Hunterston will have been carried out by Pirelli-General.

Hunterston is being constructed by the G.E.C.-Simon Carves Atomic Energy Group. Consulting Engineers to South of Scotland Electricity Board, Kennedy and Donkin.





MASTER CONTROL CUBICLE

# 'ACCESS'

(Austin Cold-Cathode Electronic
Switching System, made under licence
from the Austin Motor Co. Ltd.,
and Hivac Ltd.)

ACCESS, a static switching system using Cold-Cathode Tubes, possesses the advantage of self indication.

This control system is suitable for many applications including complex machine tool and conveyor installations.

Write for Technical Literature.





TYPICAL APPLICATION — METALWORKING TRANSFER MACHINE

# THE DONOVAN ELECTRICAL CO. LTD.

(ELECTRONICS DIVISION)

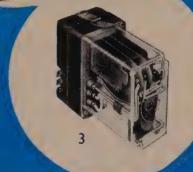
SAFUSE WORKS . NORTHCOTE ROAD . STECHFORD . BIRMINGHAM 33

Telephone: STECHFORD 2277 (5 lines)

# SERVE INDUSTRY ..







This unit embodies a synchronous motor wound for 240 volts A.C. and clutch mechanism, is provided with four change-over contacts rated at 6 amps, 240 volts A.C. and adjustable from 0.3 seconds to 6 hours. Write for leaflet E.G. M.Z.II.

This relay is the sturdlest yet designed, constructed almost entirely of steel and ceramic materials, without any glass parts. It can be operated in any direction within 50 deg. of the vertical line. This unit will withstand momentary short circuits without damage. Write for leaflet E.G. 5.8.12.

The contacts of this relay are totally enclosed and the coil operation is especially constructed to operate on A.C. supply, the unit can be mounted in any position. Contacts are rated at 6 amps. single, double and triple pole change-over.



Engel & Gibbs Limited

WARWICK ROAD . BOREHAM WOOD HERTS TELEPHONE : ELSTREE 2291/2/3/4

ELECTRICAL SWITCHGEAR MANUFACTURERS



## for all electrical work

DILEC self-bonding p.v.c. tape, specially developed for the electrical industry, overcomes many of the problems normally associated with pressure sensitive tapes.

This unique tape is a p.v.c. film formulated to provide adhesive properties in the material itself. DILEC does not 'ooze' or pick up dust and dirt. It will not perish and will last for years.

Components can be wound with DILEC and then heat sealed or H.F. welded. Even a straightforward winding provides a smooth sheath of glossy p.v.c. which is impervious to moisture, acids and other corrosive elements, and gives excellent electrical insulation.

DILEC will conform to irregular surfaces and makes an extremely effective seal when wound under a little tension. It is supplied in 50-yard rolls and is available in six British Standard Colours.

Write for comprehensive details of all Gosheron Technical Tapes and for regular copies of 'Tape Times'.

Photo on right by
courtesy of English
Electric Co. Ltd.,
and inset by
courtesy of
Smith Hobson Ltd.



Over 50 years Tape Technology Gos



THE PACKAGING & INDUSTRIAL TAPE CENTRE, ALBERT EMBANKMENT, LONDON, S.E.11

Telephone: RELiance 7600

# "TAKE MY TIP— USE SIFBRONZE WELDING EQUIPMENT!"



says Will the Welder

"DEMON" BLOWPIPES
General Duty and Cutting Models.

#### SIF-COLIBRI CUTTING MACHINE

The clockwork machine which turns a hand cutter into a precision machine cutter. Ideal for flame cutting on site.

SIF-COMBI PROFILE CUTTING MACHINE

An Automatic dual-purpose machine for all kinds of cutting work.

#### SIFBRONZE REGULATORS

Modern precision instruments giving constant pressure and volume.

#### SIFBRONZE CATSEYE GOGGLES

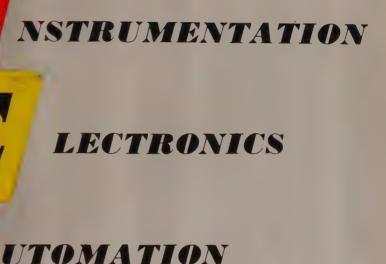
The most advanced type on the market.

If you want to know how Sifbronze equipment can help you fill in the coupon right away.

To SUFFOLK IRON	FOUNDRY (1	1920) Ltd.,	Stowmarket,	Suffolk
Please send me leaflets d	etailing Sifbron	ıze equipmen	it.	

NAME	
ADDRESS	

ER/C/1



# A COMPLETE INSTRUMENTATION SERVICE

With Evershed equipment you can meet all your process control requirements because there is an Evershed instrument for every purpose. Our Technical Advisory Service is freely available to discuss your particular problems in 'Supervisory Control.'

EVERSHED

VISIT STAND K 458 AT THE I.E.A. EXHIBITION

### RECORDER CONTROLLER

A servo operated recorder to provide a permanent record of the measured value, has been added to the already comprehensive specification of the Evershed Mark 4 Controller which has found wide application throughout the world in all types of industries. Ingenious design allows a full 4'' chart display without increase of the panel cut-out which remains at the international standard of  $144 \times 144 \text{ mm}$ 

The new controller, in two units, is completely self-contained, and embodies many proven features, e.g., exchangeable printed circuit boards, built-in test and calibration facilities, bumpless transfer, etc.

### **EVERSHED SUPERVISORY CONTROL**

'Transmission of 40 measurements over one pair of transmission lines, with simultaneous control signals (and positive confirmation) in the reverse direction over the same pair of lines'—this is the significant feature of this continuously cycling system. Added to this are: automatic monitoring of the system's correct operation, and automatic visual and audible alarms for dangerous conditions, etc.

Alternative facilities (for which the scanning cycle is rendered inoperative) are: 1. Selection "ondemand" of any of the measuring control points, or 2. Automatic initiation of the scanning cycle through changed conditions at a control point.

### ANALOGUE TO DIGITAL CONVERTER

This new converter enables analogue measurement signals of Evershed Process Control Equipment to be presented in digital form! The instrument is designed to work under industrial conditions and is fast enough to meet all industrial measurement requirements. The output circuit can operate series or parallel displays, and/or print outs etc. It is essentially a simple device which keeps routine maintenance and service requirements at a minimum.

### SOLIDS LEVEL TRANSMITTER

Evershed's comprehensive range of measurement transducers is further enlarged by this instrument which is designed to sense the level of granular solids in storage. Its output signal is suitable for application to a Process Controller, or for remote indication and/or recording.

A special feature prevents submergence of the sensing device by hopper discharged materials.

### TEMPERATURE MEASUREMENT

This transmitting resistance thermometer is a fully transistorised, highly accurate instrument generating an output signal suitable for operation with Evershed Process Control equipment. It requires a minimum of attention over extended periods, permits easy matching to existing transmission lines, embodies built in test facilities, and calibration check facilities which do not need skilled personnel.

## ALL-ELECTRIC VALVE POSITIONER

An all-electric Positioner, which operates in conjunction with a specially designed transistorised control/feedback amplifier, is now added to the range of Evershed Electro-pneumatic and Electro-hydraulic Positioners. The all-electric Positioner provides a 500 lb. thrust with an adjustable stroke of up to 2", and is capable of a response time of 6 seconds per inch.

Even under most severe operating conditions it will maintain a sensitivity of 1%.

20 MAI 1900



Movement and levels of crude oil are controlled from this panel in a Kuwait Oil Company tank farm.

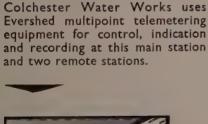


Boiler control panel at Little Barford Power Station—the first in Great Britain to be electronically controlled.

Part of Wissington sugar refinery control panel showing Evershed miniature recorders and process controllers.



The supervisory panel at the Jersey Sewerage Board's installation at Bellozane. Measurements from six out-stations are sequentially sampled and continuously displayed. Remote control is also provided.







EVERSHED



## FLOW OR DIFFERENTIAL PRESSURE TRANSMITTER — TYPE ER 125

Designed for the control and remote indication of differential pressures up to 200 in. W.G. and at static pressures up to 1,000 p.s.i. Suitable for application to processes involving oil, viscous or corrosive fluids as well as water, steam or gases.

For further information ask for leaflet S.S.1.

### GAS PRESSURE OR DIFFERENTIAL PRESSURE TRANSMITTER Type Fr 83

This transmitter embodies a limp diaphragm, and is capable of accurately measuring extremely low gas pressures. To provide local indications, a milliameter is included in the transmitter housing.

For further information ask for leaflet S.S.3.





#### SIMPLE COMPUTER — TYPE ER 92

This instrument is used to evaluate continuously the variables and constants of a controlled process. The operations performed are: Addition; subtraction; multiplication of two variables or of a variable by a constant; division of two variables, or of a variable by a constant and *vice-versa*; squaring; square root extraction.

For further information ask for leaflet S.S.10.

#### ELECTRONIC PROCESS CONTROLLER MARK IV

The Evershed 3-term Process Controller operates in conjunction with Evershed Electronic Repeater Transmitters which provide the measured value signal, and when compared with a manually adjustable 'desired value' current, develops a controller output signal which contains 3-term circuitry (i.e., proportional, integral and derivative) components.

The output signal may be used to operate Evershed electro-pneumatic, electro-hydraulic or electro-mechanical positioners, valves, dampers, etc., in order to maintain the process under control in the desired manner. For

further information ask for leaflet S.S.12.





#### STANDARD ELECTRO-HYDRAULIC VALVE POSITIONER

Of robust construction, this equipment which incorporates the hydraulic jet pipe relay principle, can be used to operate the heaviest dampers or valves. It is completely self-contained with its own motor driven pump, and accurately positions the damper or valve according to the value of the signal received from the control system, irrespective of the magnitude of forces to be overcome.

For further information ask for Publication No. 520.

INSTRUMENTATION & CONTROLS DIVISION

## EVERSHED & VIGNOLES LTD

ACTON LANE WORKS . CHISWICK . LONDON W.4

Telephone: Chiswick 3670

Telegrams & Cables: Megger London Telex 22583



Expert sales and service engineers available in ALL parts of the country. Distributed by all branches and agents of—
Shell Mex & B.P. Gases Ltd.
Calor Gas (Distributing) Ltd.
Scottish Rural Gas Ltd.
Saturn Industrial Gases Ltd.

#### BULLFINCH (GAS EQUIPMENT) LTD.

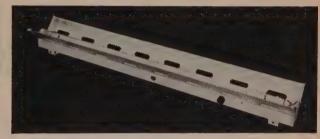
Emily Street, Birmingham 12
Telephone: CALthorpe 1164

Britain's best range of Fluorescent Fittings selected for efficient lighting by famous concerns all over the world

BRITAIN'S BEST FLUORESCENT LIGHTING TITTINGS & CONTROL GEAR

London Electricity Board





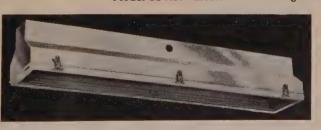
Model SSV.80 Industrial metal trough—slotted top

Startype inconstant start specific spec

power factor ballast unit.

Choke with instant start transformer unit.

Model VP.802 Industrial vapour-proof totally enclosed fitting



UTILITIES (LONDON) LTD.

Manufacturing Electrical Engineers

TUNSTALL ROAD . BRIXTON

LONDON . S.W.9

Telephone: Brixton 6811-4

Telegrams: Utilon, London, S.W.9



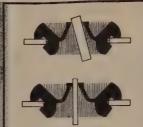
Model EP.802 Suspended or ceiling fitting with opal fluted "Perspex" diffusing cover

## THE EMPIRE RUBBER SELF CONFORMING GROMMET

. . . is the solution to many an engineering problem



Note how when sprung into position the grommet provides a perfect seal by its own permanent pressures. The also creates a tight pressure hold on the metal plate.



By reason of the designed taper of the cable entry cable entry
and the
flexibility of
the web, a
considerable
angle of cable
entry and a
variety of
cable size, are
possible

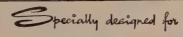


In the conventional grommet, only one thickness of plate and only one size of cable can be accommodated. No effected seal is afforded by the parallel groove.

This new development in grommets is now being produced in a range of sizes These new grommets will solve your sealing problem

Enquire for Catalogue sestion and detailed particulars. EMPIRE RUBBER COMPANY, DUNSTABLE, BEDFORDSHIRE, ENGLAND

WELCONSTRUCT



SMALL PART STORAGE - COMPONENT TRAYS SUNDRIES TRAYS

6"×4"×2"×24G Steel. Pressed in one piece. Liquid tight. Turned edges. Stove enamelled green. Very strong.



100 .. 1/9 each 1,000 .. 1/7 each

If unpainted 3d. less in each case. CARRIAGE EXTRA.

#### **Galvanised Stacking Tote Pans**

Strongly made of 22G Galvanised steel: wired rims and drop handles. Rustproof, clean, strong, Prices include punched card-holders. Minimum order, 25.



#### SPECIAL PRICES

Lots of  $12'' \times 12'' \times 6''$   $18'' \times 12'' \times 6''$   $24'' \times 12'' \times 6''$ 

25	7/1	8/2	9/2	Carriage
100	6/8	7/9	8/10	5%
500	6/5	7/5	8/5	Extra
1,000	6/2	7/2	8/2	

#### WELCONSTRUCT CO. LTD.

35 CARRS LANE, BIRMINGHAM 4. MIDIand 1691

#### "BARLECTA STOP/START SWITCHES, FIRE ALARMS LIMIT SWITCHES, Etc.



Ask for List No. 1458/ER

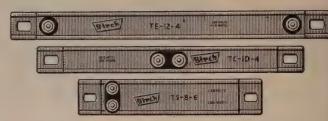


We can quote for FRACTIONAL H.P. MOTORS against enquiry

BARRIES ELECTRICAL AGENCIES, LTD. KEMP TOWN, BRIGHTON 7



#### ELEMENTS HEATING



Strip Heating Elements, incorporating highest quality electrical porcelain in chromium steel cases (1" or 1\frac{1}{2}" wide) in a wide range of lengths (6"-40"). Not suitable for immersion.

Write for list Nos. 150 & 160

Also makers of

Asbestos Woven Mats Loading Resistors Motor Operated Resistors Sliding Resistors Stud Type Resistors Toroidal Resistors

VITREOUS **ENAMELLED RESISTORS** 

Ferrule or wire end type: full range of 24 sizes—1½—250 watts. (List VE 190).



H. A. BIRCH & CO. LTD. WOOD STREET, WILLENHALL, STAFFORDSHIRE

Telephone WILLENHALL 494 • 495 • Grams WILOHM WILLENHALL LONDON OFFICE: HERGA WORKS, WALLINGFORD ROAD, UXBRIDGE MIDDLESEX. Tel.: UXBRIDGE 5211

### TIMERS by the RODENE

Electrical Co. Ltd.

See them all on

STAND B76 AT THE **INSTRUMENTS ELECTRONICS** AND

**AUTOMATION EXHIBITION** 



WRITE FOR LIST R.1

D. ROBINSON and COMPANY 717 LONDON ROAD, HOUNSLOW, MIDDLESEX Tel.: HOUnslow 6266-6267 & 8338



the most
advanced

MULTI-RANGE
TEST METERS

ever
designed...

Accurate readings can be taken with the instrument in any position. The resistors, rectifier, transformer, movement, switches and automatic cut-out are mounted on a robust printed circuit board, enclosed in a strong attractive, two-tone dustproof case, with a unique carrying handle.

Send for leaflet No. SK.50/6002/ER.



SELECTEST
SUPER K & SUPER 50

### SALFORD ELECTRICAL INSTRUMENTS LTD.

PEEL WORKS, SILK STREET, SALFORD 3, LANCASHIRE, Tel: Blackfriars 6688 London Sales Office: Magnet House, Kingsway, W.C.2. Tel: Temple Bar 4668

A Subsidiary of THE GENERAL ELECTRIC CO LTD. OF ENGLAND

See our exhibits on

STAND E.211

# POWER for Rhodesia



# 600,000 Kilowatts under fingertip control



The Kariba Dam project, one of the most ambitious in the world, is a major advance in the development of Rhodesia. Power from the six 100 MW generators is transmitted via 330 kV power lines to the 'copper-belt' towns and the larger towns of Northern and Southern Rhodesia.

Both the generation and the transmission of this gigantic output of power is controlled and supervised by STC Remote Control and Indication Systems. The continuous monitoring of the generation and power flow, together with the control and indication of switch positions, enables control engineers to supervise the generation and distribution of power over 935 miles of transmission line. Included in these systems are specially developed items of apparatus which present full information in concise, clear and simple form on minature indication diagrams, enabling the engineers to take appropriate action.

STC's unrivalled experience in the field of Remote Control and Indication is acknowledged in the award of this contract which is one of the biggest of its kind.

Consulting Engineers: Merz & McLellan



# Standard Telephones and Cables Limited

TELECOMMUNICATION ENGINEERS

CONNAUGHT HOUSE . ALDWYCH . LONDON . W.C.2 . ENGLAND



# Switches

For Instrument and Electronic Applications



\* Cat. No. 81058-BT. Double Pole Double Throw. 2 Position Lever Type. Back Connecting Lugs.



Cat. No. 81046. Single Pole Single Throw. 2 Position Lever Type. Back Connecting Lugs.



Cat. No. 81055-B-BP. Double Pole Single Throw. 2 Position Insulated Lever Type. Back Connecting Lugs.

The exacting conditions of service demanded by modern techniques in electronic equipment and instrument development are fully matched by this new range of ARROW bakelite enclosed switches.

Their main characteristic is the maintenance of low contact resistance after considerable life.

Circuits available S.P.S.T., S.P.D.T., D.P.S.T., D.P.D.T.

★ BIASED ACTION SUPPLIED FOR ALL CIRCUITS.

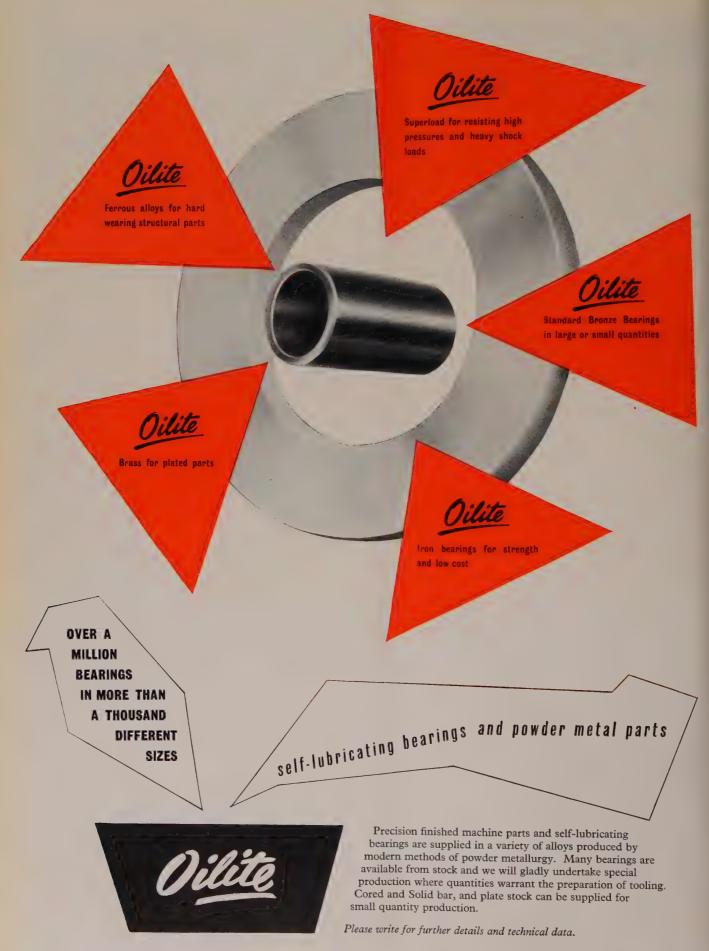
Maximum rating 3 amps at 250V AC/DC

Write today for full particulars of these instrument switches.

Visit us at the I.E.A. EXHIBITION Stand No. Q 738

ARROW

ROW ELECTRIC SWITCHES . HANGER LANE . LONDON . W.5



THE MANGANESE BRONZE & BRASS CO LTD Elton Park Works Hadleigh Rd Ipswich · Grams: Oilite Ipswich · Tel: Ipswich 55926

# BATTERY CHARGERS

HEAYBERD Battery Chargers, incorporating metal rectifiers, embody the results of more than 25 years' experimental work and the understanding of customers' special requirements.

List No. 1048 describes over thirty different types of Battery Chargers.

Write for your copy today.





Charges three to thirty-six 2-volt cells at one to eight amperes

#### . C. HEAYBERD & CO. LTD

Head Office: GREENWICH SOUTH STREET, S.E.10

Works: Greenwich.

TIDeway 4646

Cables and Telegrams: "Heayberd, Green, London"

Insist on T.E.C.

ELECTRONIC CONTROL EQUIPMENT, POWER AND DISTRIBUTION TRANSFORMERS TO 100 kVA, LOW VOLTAGE, FLASH TEST, RECTIFIER AND DENTAL PLATING UNITS, METAL WORK, TRANSFORMER REPAIRS AND CHOKES



### IMPORTANT

A new section for

# FARM BUILDINGS and ancillary equipment

used in their construction will be introduced at this year's

#### DAIRY SHOW

to be held at

#### OLYMPIA - LONDON

25th, 26th, 27th and 28th October



Applications are now being accepted for trade stand space in this new and unique section, the focal point of which will be an extensive feature exhibit by the Ministry of Agriculture, Fisheries and Food.

Apply now for further details to the Secretary, British Dairy Farmers' Association, 17 Devonshire Street, London, W.I. Telephone: Langham 6903.



# ENBRAY CONTACTORS FOR HEATING LOADS

RECENT CONTRACTS INCLUDE:-

- Contactors for ROAD HEATING
   The Mound, Edinburgh.
- For FOOTBALL GROUNDS Murrayfield, Edinburgh.
- For DOMESTIC SPACE HEATING 300 Houses, S. Scotland.
- And for Night Storage, Metal Pots, Oil Heating, etc.

Makers of Quality Control Gear for nearly forty years

## E. N. BRAY LTD 40

Head Office and Works:

BRITANNIA ROAD, WALTHAM CROSS, HERTS

Telephone: Waltham Cross 22212-5

GLASGOW:

Telephone: Douglas 1271

Branches: MANCHESTER:

Telephone: Blackfriars 4791

BIRMINGHAM:

Telephone: Four Oaks 2185

# CHANNEL Spring Capped CONDUIT

**ELECTRICAL TRUNKING** 

## saves time, money & trouble

- \* Easier and cheaper to install.
- \* Wiring instantly accessible for maintenance.
- \* Ideal for power, lighting, telephone and intercommunication systems.

Available in the following sizes:

# CHANNEL Spring Capped CONDUIT



Write or telephone for Publication No. RA178

CHANNEL CONDUITS LTD., STATION ROAD

WINSLOW, BLETCHLEY, BUCKS

Telephone: Winslow 337

RA178

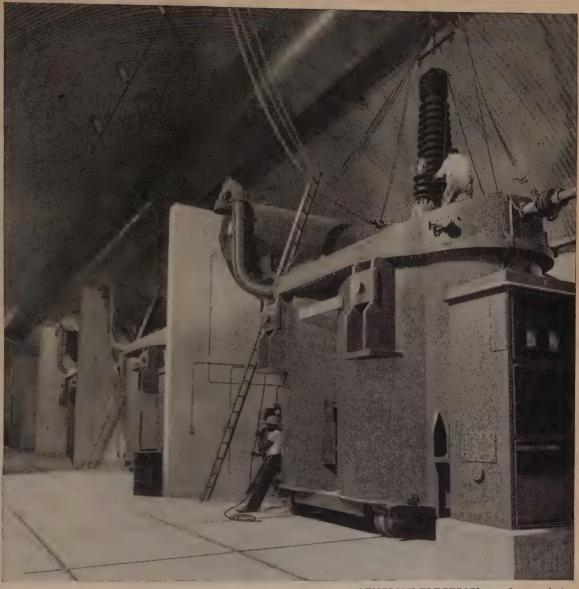


Phone: COPpermill 2248/9
Telegrams:

Elmicmer, Easphone, London

EAST LONDON MICA WORKS

RINGWOOD RD., WALTHAMSTOW, LONDON, E.17



'ENGLISH ELECTRIC' transformers during erection in the underground gallery at Kariba.

# at Kariba

Power from the six 100 MW hydro-electric generators at the Kariba Dam on the Zambesi River is stepped up from 18 kV to 330 kV by three 240 MVA banks of 'ENGLISH ELECTRIC' single-phase O.F.W. generator transformers. Ten 80 MVA single-phase units, including one spare, have been supplied to the Federal Power Board to the instructions of Messrs. Merz and McLellan, Consulting Engineers.



THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2.



#### FRIDAY 20 MAY 1960

# ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.

General Editor: J. H. COSENS

Technical Editor: A. R. POLLARD, A.M.I.E.E.

#### IN THIS ISSUE

Still a Competitor	947	The stimulus provided by a lively gas industry has played a part in the progress of electricity supply and a continuation of this competitive spirit is welcomed
Kariba	949	Illustrated description of the first stage of the Kariba hydro-electric scheme in Southern Rhodesia which was officially opened by the Queen Mother on Tuesday. Two 100 MW sets are now in operation in the underground power station
Insulation Tests	959	Author's summary of a paper presented to the Institution of Electrical Engineers last week, and points from the discussion
Copper Rod Rolling	961	The largest of its type in the world, a copper rod rolling mill costing £1½ million has been installed at the Prescot works of British Insulated Callender's Cables, Ltd. The mill, which was inaugurated last week by the President of the Board of Trade, is fully automatic
Radioisotopes	965	Review of the work being carried out by the U.K.A.E.A. Isotopes Research Division, whose new premises at Wantage were opened by Lord Hailsham last week
Modern Refrigerator Factory	967	At the Luton factory of Electrolux, Ltd., the first stage of a £1½ million extension has recently been completed. At the same time production lines have also been reorganised, substituting flow production for some of the batch production previously carried out
Lighting Problems and Progress	974	Papers and discussions at the biennial summer meeting of the Illuminating Engineering Society held at Harrogate this week
<b>* *</b>		<b>*</b>
Views on the News	957	New Electrical Equipment 986
Letters to the Editor	958	Generation and Development 988 Parliamentary Report 989
Railway Modernisation Progress	968	Parliamentary Report 989 Next Week's Events 991
I.E.A. Exhibition	969 970	Contract Information 992
Industrial News	979	CLASSIFIED ADVERTISEMENTS 115
Personal and Social	982	INDEX TO ADVERTISERS 130

**VOLUME 166 NUMBER 21** 

Eighty-Eighth Year of Publication

**FRIDAY** 

PRICE 1s 6d

Electrical Review Publications Ltd. 1960. Permission in writing from the Editor must first be obtained before letterpress or illustrations are reproduced from this journal. Brief abstracts or comments are allowed provided acknowledgment to the journal is given.

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.I.

Telephone No. Waterloo 3333 (65 lines). Registered at the General Post Office as a Newspaper.

Telephone No. Waterloo 3333 (65 lines). Registered at the General Post Office as a Newspaper.

Annual Subscription: Home £4 0s 0d; Overseas £5 15s 0d; U.S.A. and Canada \$16.00.

ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Coutts & Co."

# FOR DEPENDABILITY

a and a complete the complete of the complete

fit and forget



TERMINAI BLOCKS



TYPE R – 20 AMPS with moulded-In inserts for conditions where vibration is experienced



TYPE AD4/H -- 60 AMPS for heavy duty



TYPE M/TAG – 20 AMPS for electronic chassis, etc. where soldered connection is made to one side of block

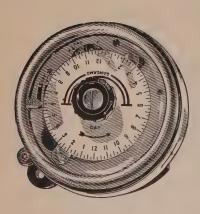
AND MANY MORE . . . MAY WE SEND YOU DETAILS?

Many of our comprehensive range are Admiralty, Joint Service and G.P.O. approved. Grelco blocks have a high safety factor and are constantly specified where reliable performance under arduous conditions is required

GRELCO LIMITED MINEHEAD SOMERSET

## SANGAMO

## time switches



The superiority of Sangamo Time Switches, both in design and performance, has been established over more than twenty years of intensive world service. In addition to 24 hour-dial, solar dial and Short Interval types are also available. The 24 hour range also includes models with synchronous controlled spring reserve. The whole range of Sangamo Time Switches is now fitted with clear polystyrene covers, giving greater protection and improved visibility as well as an enhanced appearance.

Full details will gladly be supplied on application.

SINGLE PHASE AND
POLYPHASE WATTHOUR
METERS

SYNCHRONOUS TIME SWITCHES

SYNCHRONOUS MOTORS AND MOTOR UNITS

PANEL & SWITCHBOARD
INSTRUMENTS
D.C. Moving Coil, A.C. Rectifier,
H.F. Thermocouple, A.C./D.C. Moving Iron

PORTABLE INSTRUMENTS D.C. Moving Coil, A.C. Rectifier, H.F. Thermocouple, A.C./D.C. Moving Iron A.C./D.C. Dynamometer

LABORATORY STANDARD
INSTRUMENTS
D.C. Moving Coil, A.C./D.C. Dynamometes



CURRENT TRANSFORMERS
FREQUENCY METERS
ALL-PURPOSE TEST SETS
AIRCRAFT INSTRUMENTS
RATIOMETERS · TACHOMETERS
WESTON STANDARD CELLS
ELECTRICAL THERMOMETERS
\*\*PHOTRONIC" PHOTO ELECTRIC
CELLS · PHOTOMETERS

#### SANGAMO WESTON LIMITED

ENFIELD: MIDDLESEX Tel: ENField 3434 (6 lines) and 1242 (6 lines). Grams: Sanwest, Enfield
Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151

Branches: London, CHAncery 4971; Glasgow, Central 6208; Manchester, Central 7904; Newcastle upon Tyne, Newcastle 26867; Leeds, Leeds 30867; Liverpool, Central 0230; Wolverhampton, Wolverhampton 21912; Nottingham, Nottingham 42403; Bristol, Bristol 21781; Southampton, So'ton 23328.

# ELECTRICAL REVIEW

20 May 1960 Vol. 166 No. 21 Established 1872

## Still a Competitor

ADVERTISING by the electricity supply industry is frequently criticised by the unknowledgable who think that because the industry has a monopoly it has no competition. We know, however, that the progress made by electricity has not been entirely due to its superior attributes: it has had to struggle against some very active and powerful rivals, particularly the gas industry. Although competition from raw coal and oil has seemed to have become a little stronger, gas may still be regarded as the principal competitor. It is recognised by electrical men that it has been the liveliness of the gas industry which has helped to keep them alert and active.

Consequently we are inclined to feel a little sorry at the position disclosed recently by Mr. W. Hodkinson, vice-chairman of the North-West Gas Board, in his address as chairman of the Manchester & District Section of the Institution of Gas Engineers. Mr. Hodkinson showed that electricity sales had risen on the average by over 7 per cent annually since 1948, and that it was likely that this rate of progress would continue. In the same period the increase in gas demand at its best never rose beyond 4 per cent

per annum and now it appeared that the demand was static.

Mr. Hodkinson said that in 1951-55 the gas industry had been able to rely on the rise of industrial and commercial sales to offset the downward trend in the domestic sphere, but since then the rate of increase of those sales had slowed down while the fall in domestic supplies had continued. He thought that the rise in gas sales during and just after the war was exceptional and mainly due to fuel shortage. "The static or downward trend of demand in the years since 1955 reflects the failure of gas to compete with other fuels under conditions of relative abundance of fuel supply." But later in his address he showed that while between 1950 and 1958 the average price of gas increased by 62 per cent, that of electricity rose by only 32 per cent. Coal had become relatively dearer for the gas industry than for the electricity supply industry and a further important advantage for electricity was the progressive reduction in the capital cost of generating plant. This the gas industry still had to match and its current plans would make a vital contribution.

But Mr. Hodkinson did not believe that all was lost. There was still scope for expansion, particularly in "whole-house" heating. He called for an energetic programme of appliance development and stressed that in the severe competitive battle that lay ahead imagination and ingenuity, and a refusal to be tied by established practices, would be the vital qualities required for success. We look forward to the "competitive battle" to keep

our own industry on its toes.

#### **ECONOMICS OF KARIBA**

The difference in the geographical situation of the copper and coal bearing deposits in the Central African Federation is one of the main causes of the development of the hydro-electric potential of the Zambesi. capacity of the country's railway system was stretched to its limit in transporting the coal to operate its copper mines. When copper was at over £400 per ton, production was threatened because of coal shortage and electricity had to be imported from the Belgian Congo. A large increase in available power was, therefore, urgently required for the Federation to gain economic strength.

Two hydro-electric schemes were investigated—at Kariba and Kafue. Kariba was found to be more suitable for long-term development. It was estimated that the complete 1,500 MW project would cost £113 million or £76/kW. The first part of the scheme will have a capacity of 600 MW and will cost about £80 million or £133/kW. Equivalent thermal plant would have cost £67/kW, but production costs over the first ten years would have been £44 million more than at Kariba. Thus, considering both capital and running costs, the overall saving over the first ten years will be £31 million.

#### COPPER ROD ROLLING

The new copper rod rolling mill of British Insulated Callender's Cables, Ltd., which is described in this issue (p. 961), provides a first-class illustration of the way in which electrical controls and drives can be applied to an industrial process to speed up production, improve productivity and at the same time make it possible to maintain a uniformly high quality in the finished Those who have seen an old-fashioned rod mill in action will agree that it is a most spectacular business demanding great dexterity on the part of the mill operators. The production rate which is possible LAMP PRICES with these mills, however, is comparatively low.

The first mill installed by B.I.C.C. in 1900 had an annual capacity of 6,000 tons but by applying electrical control and drive techniques to the fullest advantage the new mill can produce 100,000 tons of copper rod in a year with a crew of only 17 men working on the basis of two  $8\frac{1}{2}$  hour daily shifts. In an age when other countries seem to be making the biggest and best of

#### POWER CONVENTION NUMBER

The twelfth British Electrical Power Convention is being held at Bournemouth from 30th May to 2nd June. Next week's Electrical Review will contain an outline of the programme and a special portrait of the President, Viscount Chandos. Among the articles will be one on the Bournemouth Sub-Area. another on the local trolley-bus system, and forecasts by the Area Board chairmen of their distribution programmes for the immediate future

most things it is encouraging that this British designed and built mill is the largest and most modern rod rolling mill in the world. In operation it is impressive. A hot wire bar, 54in long and weighing 265 lb, enters the mill, and 95 seconds later it emerges as a coil of 1/4 in diameter rod, 1,300ft long, at a rate of 3,500ft/min. This mill will supply 75 per cent of the copper rod used by the British cable making industry.

#### BLANKET FIRES

Investigations into fires caused by electric blankets and bed-warmers were made in 1950 and 1956 by the Fire Offices' Committee Fire Protection Association; the results are reported in the April issue of the Association's journal. In the earlier year 1,000 fires were analysed and it was found that the causes of 292 of them were broken elements or short-circuits while 146 were due to overheating—no thermostat fitted. By 1956 there had been a substantial increase in the number of blankets and warmers in use and the number of fires rose to 2,622; of these 737 were attributed to broken elements or short-circuits and 400 to over-Ten other specific causes are mentioned, some arising from bad design and some from mishandling, but it is not possible to decide with any certainty how many fires can be debited to each of these broad categories.

It seems to be implied, however, that a substantial number of the fires were caused by misuse and abuse although it is clear that a great deal of blame must also rest upon the manufacturers. The Association considers that blankets complying with B.S. 2612:1956 (amended 1958) should be inherently reasonably safe, but as many fires are the result of careless treatment and of faults which develop after long use, fires cannot be prevented entirely by improved design.

Nearly all the leading manufacturers of general lighting service lamps have announced a reduction in the prices of coiled-coil lamps such that the price is now the same as that of the single-coil lamps. production of a coiled-coil filament is an expensive operation and a very high degree of precision control is required. Why then have the prices of the two types of lamp reached equality? Until now, the public have generally preferred to buy the cheaper lamp. However, the coiled-coil lamp has been further developed over the past few years and many objections with regard to robustness have now been overcome. It also appears that production techniques have been "streamlined."

The position has therefore been reached where the manufacturers would prefer to concentrate their production on the more efficient lamp. They hope that, by reducing the price of the coiled-coil lamp, the demand for the single-coil lamp will diminish and cease. This will, of course, benefit the consumer as he will now obtain a 15 per cent increase in light output for the same initial and running cost.



Aerial view of Kariba dam showing also the switching station on the south bank (left). (Photo-Federal Power Board)

# KARIBA

## First Stage of £113 Million Project Opened by the Queen Mother

The first two 100 MW sets of the 600 MW, £80 million first stage of the Kariba hydroelectric scheme are now operating, and this part of the project is due to be completed in 1962. The final stage consists of a second underground power station with a capacity not less than 900 MW

AST Tuesday Queen Elizabeth, the Queen Mother, officially opened the Kariba hydro-electric scheme on the Zambesi River in Southern Rhodesia. When completed, the scheme will have a total capacity of at least 1,500 MW. The first stage consists of the main dam, a diversion tunnel and an underground power station in the south bank of the river. This station will house six 100 MW hydro-electric units, two of which are already in operation. The final stage of the scheme will comprise a second underground station in the north bank and this will have a capacity of not less than 900 MW. The firm flow available is equivalent to a continuous discharge of 42,000 cusecs, which would provide an annual energy output of 8,500 million kWh.

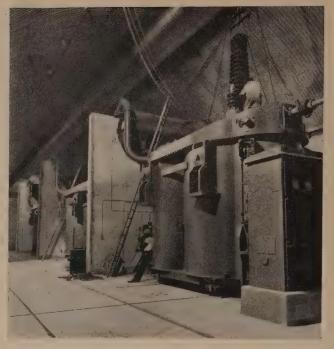
Power and transport are the two most pressing needs of the Federation. In the past, coal has been short at the copper mines as the railways have not sufficient transport capacity, and arrangements were therefore made to import electrical power from the Belgian Congo. Detailed surveys for hydro-electric schemes on the Zambesi at Kariba Gorge and at Kafue were carried out and the Federal Prime Minister announced in March, 1955, that the Kariba scheme would be adopted. The Federal Hydro-Electric Board was established in June, 1954, and in May, 1956, it was reconstituted as the Federal Power Board. It was charged with the duty of building the Kariba scheme as well as the associated transmission system and was also given powers to form an interconnection between its system and that of any licensee or local authority and to direct the subsequent operation of the local generating plant. Due to the urgency of the project, the design of the main works was carried out while a

contract for preliminary works was awarded in July, 1955, to the Cementation Co. These preliminary works consisted of access roads, a cofferdam and diversion channel on the north bank and a diversion tunnel in the south bank.

The main civil contract, which consists of the main dam and the underground power station of the first stage, was awarded in July, 1956, to the Italian firm of Impresit South Africa (Pty.), Ltd., at a figure of £25,278,000. Another Italian-controlled firm, Rhodesian Power Lines (Pvt.), Ltd., won the second largest contract of £9,935,000 for transmission lines. Work started under the main contract in September, 1956, and in the November the first concrete for the main dam was poured by Lord Malvern, who had recently retired from the office of Federal Prime Minister.

#### **Construction Stages**

The construction of the scheme was divided into four phases. Blocks of the main dam containing four temporary openings were concreted inside the circular north bank cofferdam which had been started under the preliminary contract. When these blocks had reached a sufficient height, rockfill was dumped from a road bridge downstream of the main project and in July, 1957, gaps were blasted in the north bank cofferdam. This caused the river to be diverted partly through the diversion channel and the temporary openings in the blocks of the main dam and partly through the 1,200ft-long diversion tunnel. Work then began on the main circular cofferdam in the centre of the river. Construction of the main dam proceeded inside the new cofferdam and above the blocks built earlier in the north bank cofferdam. Work on the north bank cofferdam was interrupted in February, 1957, by floods and just a year later floods again interrupted work, this time inside the main cofferdam, but by September the main Kariba dam was half completed. In

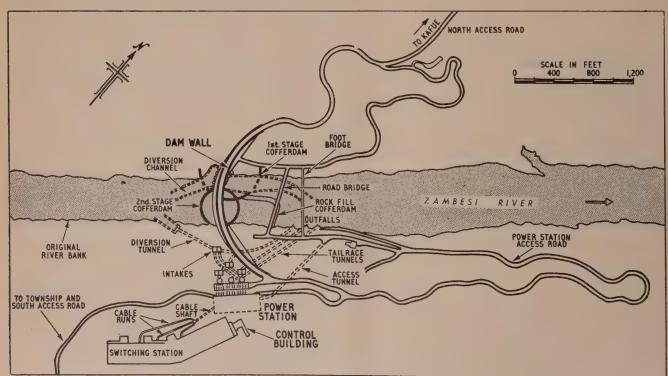


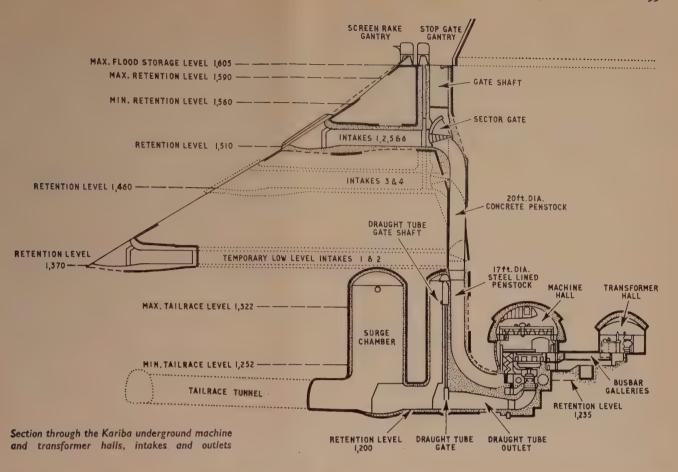
Underground transformer hall showing single-phase 18/18/191 kV, 80 MVA generator transformers

December, 1958, the diversion tunnel and the temporary openings in the northern end of the main dam were sealed and impounding of the reservoir commenced. Construction of the dam proceeded, keeping ahead of the rising water, and was completed on 22nd June, 1959.

The concrete arch dam has a maximum height of 42oft and a crest length of 2,025ft. The width of the roadway across the top of the dam is 40ft and six floodgates, each 30ft long and 31ft wide, are incorporated in the dam, which will eventually create a reservoir 175 miles long

Plan of site also showing position of constructional cofferdams





Underground machine hall looking upstream. (Photo—Federal Power Board)



and, in places, 20 miles wide. It will have an area of approximately 2,000 sq miles.

#### **Power Station**

The "A" station comprises two main chambers with interconnecting tunnels. The larger chamber, which is 468ft long by 75ft wide by 132ft high, contains the six 100 MW generating sets and their switchgear. The smaller chamber, which is 537ft long by 55ft wide by 60ft high, contains the 18/330 kV, 240 MVA generator transformer banks and the surge divertors. The control room and administrative offices are on the surface directly above the power station, and access to the station is by two electric lifts which traverse the 600ft deep shaft in under one minute.

The first of the six 100 MW hydro-electric units began operating on 28th December, 1959. The second unit is now in commission, and a third should be operating towards the end of this year. Two more sets will be operating in 1961, and the sixth will be commissioned in 1962.

Each generator weighs 720 tons, is 40ft in diameter and is rated at 100 MW at 0.9 power factor lagging, 18 kV, 50 c/s, at 166.7 r.p.m. The generators, which are supplied by the Associated Electrical Industries, Ltd., are driven by Francis turbines. These turbines, which are being supplied by Boving & Co., Ltd., are each designed to produce 140,000 b.h.p. with a net head of 282ft at a speed of 166.7 r.p.m. Two 200 ton overhead travelling cranes are incorporated in the power station.

Water for each turbine flows from the intake through a short, horizontal, concrete-lined tunnel to a vertical penstock, the upper part of which is concrete lined and the lower part steel lined, with a diameter of 17ft. A sector gate is installed at the top of each penstock and it was therefore considered unnecessary to provide inlet valves

for the turbines. After passing through the turbines, the water flows through three tailrace tunnels provided for the six turbines. These tunnels are long enough to require a substantial surge chamber between the tunnel and the two draught tubes to which each is connected. The hydraulic layout is unusual in that the water enters and leaves the turbines on the same side of the power house, the draught tubes being situated directly underneath the penstocks. Each tailrace tunnel has a length of about 950ft with an equivalent circular diameter of 34ft.

It will be seen from the sectional drawing of the power station that temporary low-level intakes have been constructed for Nos. 1 and 2 sets, since both these sets are operating before the level of the reservoir has risen sufficiently to allow use of the main intakes.

#### **Electrical Connections**

Power is transmitted from Kariba at 330 kV via a bank of three single-phase 18/18/191 kV, 80 MVA transformers for each pair of machines. Single-phase units were selected due to transport limitations and the units, which are connected Ydd with solidly-earthed neutral, are housed in the underground transformer hall. No tappings are provided, since the generator voltage range is wide enough to make them unnecessary. Cooling is by water tapped from the penstocks. Ten of these units have been supplied by the English Electric Co:, leaving one spare unit.

The generator transformers are connected to the switchgear by 330 kV single-core, oil-filled, lead-covered cable of 0.85 sq in copper cross-section, insulated for an impulse level of 1.5 MV and stressed to 110 kV/cm at the conductor surface. From the terminals of the transformers, the cables run through a 240ft-long horizontal tunnel before rising up a 540ft vertical shaft. The remainder of the route is in steeply-rising ground

Aerial view of switching station with the control building in the foreground. (Photo—Federal Power Board)



terminating at the switching station. In the 22ft diameter shaft the cables, which were supplied by British Insulated Callender's Cables, Ltd., are cleated in flat formation.

The 330 kV circuit-breakers have a breaking capacity of 7,500 MVA and are of the bulk oil lenticular-tank type with six breaks per phase, each shunted by a linear resistor with six auxiliary breaks to interrupt the resistor current. Twenty-five of these circuit-breakers have been supplied by Associated Electrical Industries (Switchgear Division) for the main switching station and the substations on the transmission system. One hundred isolators were also supplied, and these have a hinge mechanism which rotates the contact blade through 45° while engaged with a fixed contact, thus releasing the contact pressure before the arm begins to lift.

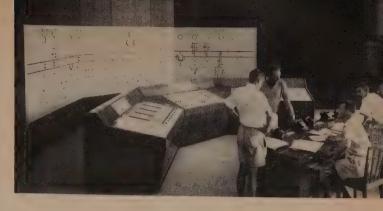
#### **Transmission**

The 330 kV transmission system consists of steel-cored aluminium conductors suspended from steel towers. The copperbelt at Kitwe is the first area to be served, since its needs are most urgent, and the erection of the transmission line to this area, which is 275 miles north of Kariba, was completed in November, 1959. The first line to the south will be to Norton and thence to Salisbury and Sherwood. Single-circuit lines with double-shield wires have been used due to their better lightning performance. The conductor selected has 54/·118in strands of aluminium with a 7/·118in steel core and was supplied by B.I.C.C., Richard Johnson & Nephew, Ltd., and the Aluminium Wire & Cable Co., Ltd.

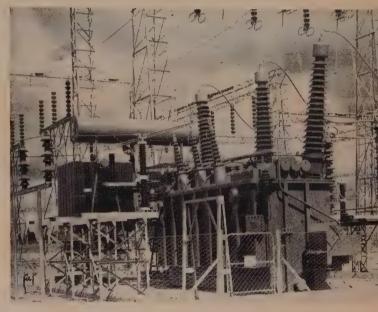
At Kitwe, the transmission line is coupled to a 220 kV system connecting the hydro-electric stations of the Belgian Congo with Northern Rhodesia. This 220 kV system was commissioned in 1956 and two English Electric 60 MVA, 220/72-6/105 kV three-phase transformers were originally installed at Kitwe. Subsequently,

Part of the Kariba switching station





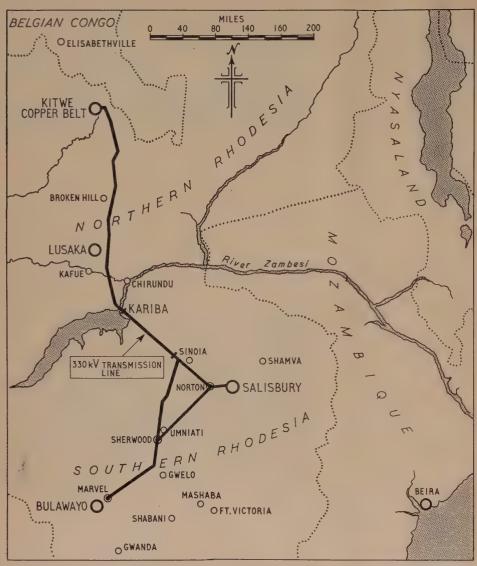
Control room in the Kariba control building. (Photo—Federal Power Board)



Norton substation with 330/88 kV, 60 MVA transformer

The Kariba switching station with the dam in the background





angle of swing becomes excessive. Reverse power relays are also fitted at certain points where it is possible for the lower-voltage networks to attempt to supply the charging currents of the 330 kV system.

The protection of generators and reactors consists of overall differential protection with definite minimum-inverse-time back-up relays. Transformer windings are separately protected by balanced earth-fault protection and over-current relays for phase faults.

A system control centre has been established at Sherwood substation, between Norton and Bulawayo. The main communication control throughout the system is by superimposed power line carrier working in conjunction with frequency-modulated voice-frequency telegraph equipment. From one to six power line channels per feeder are used and each carrier channel has a bandwidth of 4 kc/s. The carrier frequencies

Left: Map of transmission system

Below: Part of the 330 kV transmission line system

two more English Electric transformers of this rating were supplied. Two 120 MVA, 330/234 kV three-phase auto-transformers with separate boosters have been supplied by Ferranti, Ltd., for connecting the Kariba line to the existing system at Kitwe.

In the south, two standard voltages are in use, namely, 88 and 33 kV. Eight 60 MVA, 330/88 kV three-phase double-wound transformers and four 60 MVA, 330/33 kV three-phase double-wound transformers are being supplied by Ferranti for these substations. All units are provided with fully automatic on-load tap-changing gear.

All 330 kV overhead lines, with the exception of the Norton-Salisbury link, are protected by Reyrolle type H three-zone high-speed distance protection and, because of stability problems, the distance protection is arranged to give accelerated tripping for second stage faults by means of h.f. carrier signals transmitting over the power lines. The Norton-Salisbury feeder is protected by single-zone distance protection with coded carrier inter-tripping between the 33 kV circuit-breakers at Salisbury and the 330 kV circuit-breakers at Norton.

Special system-stability relays are fitted at all points to ensure that distance protection does not maloperate during conditions of system swinging and, if required, they can be arranged to trip the circuit-breakers if the



lie between the extremes of 84 and 458 kc/s. Each power line carrier channel consists of a speech circuit and up to six voice-frequency telegraph channels. The latter are allocated to supervisory communications and control, telemetering, teleprinter and telephone dialling and two spare channels.

The open or closed position of each 330 kV circuitbreaker and isolator throughout the whole network is continuously supervised by means of the communications and control equipment provided at each station. Every change of condition is signalled by means of a constant total train of pulses over the supervisory channel sounding an alarm bell in the system control centre. To enable the control operator to know the load on the network at each supply point and the amount of power being generated, a telemetering system is used to transmit measured quantities of transmitted kW, reactor kVA and busbar voltage indications. Pulses are generated in integrating meters at the substations such that the rate of pulsing is proportional to the power flow. To achieve an economy in the transmission channels, a system of time-division multiplexing is employed.

In addition to the control and communication equipment, which was supplied by Standard Telephones & Cables, Ltd., a direct wire indicating control and alarm annunciation equipment for Kariba power station and switching station has also been supplied by the same company. This equipment includes provision for starting turbines, bringing them up to speed, synchronising and connecting them to the busbars. The power station is controlled from a compact desk backed by a mimic diagram indicating the switch conditions, and the operator has control of all machines in the power station.

The civil consulting engineers to the Federal Power Board are Messrs. Gibb, Coyne, Sogei (Kariba) (Pvt.), Ltd., formed in Rhodesia from the firm of Sir Alexander Gibb & Partners, of London, and from the two French



System stability relay

firms, MM. A. Coyne & J. Beller and the Société Générale d'Exploitations Industrielles (Sogei). Messrs. Merz & McLellan are acting as the mechanical and electrical consulting engineers.

Acknowledgments are due to the consulting engineers and the main British contractors for assistance in the preparation of this article.

The main contractors are:—Civil engineering and building works, Impresit Kariba (Pvt.), Ltd., Cementation Co., Ltd., John Laing & Son, Ltd., and Richard Costain, Ltd.; water turbines, Boving & Co., Ltd.; generators and 330 kV switchgear, Associated Electrical Industries, Ltd.; 330 kV transformers, English Electric Co., Ltd., and Ferranti, Ltd.; main power station cranes, Babcock & Wilcox, Ltd.; 330 kV cables, British Insulated Callender's Cables, Ltd.; 88 kV cables, Pirelli-General Cable Works, Ltd.; control communications equipment, Standard Telephones & Cables, Ltd.; and transmission lines, Rhodesian Power Lines (Pvt.), Ltd.

#### EUROPEAN ELECTRICAL APPLIANCE COUNCIL

A MOVE towards greater co-operation between manufacturers of domestic electrical appliances in the Common Market and the "Outer Seven" countries has been announced by the British Electrical and Allied Manufacturers' Association. The Conseil Européen de la Construction Electro-Domestique (C.E.C.E.D.), which comprises representatives of manufacturers of household electrical equipment in Germany, France, Italy, Belgium and the Netherlands, together with Switzerland and the United Kingdom, met in London last week to discuss technical, commercial and financial matters affecting the industry.

On the initiative of the United Kingdom, representatives of electrical manufacturers in Sweden, Finland, Denmark and Austria were invited to London at the same time, to enable them to take part in informal talks with manufacturers in the other economic group. The result has been a cordial invitation from the C.E.C.E.D. to these countries and Norway to join the Council and so form an organisation representative of the main countries of Western Europe concerned with the manufacture of household electrical equipment. The enlarged Council will provide a

forum for discussion of common problems, including technical and fiscal matters, as well as the facilities for an interchange of information and statistics which will help the development of the industry.

M. Coite of France (president of the C.E.C.E.D.) said: "A new spirit of co-operation is already growing up among manufacturers within the Common Market—a spirit which we should like to see extended throughout the whole of Western Europe. We hope that our decision to invite manufacturers of domestic electrical appliances in other countries of Western Europe to join us will be only the beginning of a new era of industrial co-operation."

Mr. Stanley F. Steward, director of the B.E.A.M.A., said: "We have supported this action because we believe that any move towards closer relations among manufacturers in a major industry such as ours will point the way to wider co-operation between our countries in the economic field. We have received encouragement from the President of the Board of Trade, when he attended our Export Conference, to bring about this continuing consultation in the electrical appliances industry."

# Standards Engineers' Conference

THE sixth conference of engineers responsible for standards was held on 11th May in London. At the morning session, the chairman, Mr. R. E. Mills (H. M. Hobson, Ltd.; chairman of the Institution of Production Engineers' Standards Committee) introduced Mr. Lewis Wright (past-chairman of the British Productivity Council and chairman of the T.U.C. Production Committee), who gave the opening address. Mr. Wright recalled that 3,000 British Standards were in operation today but he thought that at least 30,000 ought to be in use. Progress was required not only in increasing the number of engineering standards, but improvement was necessary in industrial communications. A greater effort should be made to standardise technical terms.

Before introducing the second item on the agenda, the chairman noted that, due to limited accommodation, some applications for attendance at the conference had had to be refused, and he apologised to those concerned. Mr. Mills then introduced Mr. N. A. McNeill (chairman of the Council of the Engineering Equipment Users' Association and chief engineer of Unilever, Ltd.), who gave a talk entitled "Problems Related to the Use of British Standards in Company Standards Operations." He said that the responsibility for promoting greater use of British Standards rested largely with the British Standards Institution to see that documents were precise in their terms for application and simple to interpret. The manufacturer also had to give more publicity to standards and their relation to their proprietary products. In the ensuing discussion, some speakers referred to the apparent lack of cognisance of the views of users when drafting British Standards, and one speaker deplored the time taken to prepare some standards.

The final item in the morning discussion, "The Place of Standards in Production and Quality Control," was introduced by Mr. I. R. Smith (chief inspector, Bristol Aircraft, Ltd.). To maintain quality, he said, it was first

necessary to set the standard that the manufacturer wished to achieve and these standards should be applied at the prototype stage of design.

The first item of the afternoon session concerned proposals for an association of those concerned with standards. Mr. H. A. R. Binney (director, British Standards Institution) reported that the panel which had been formed to consider the project had suggested that the most suitable and economical scheme would be to arrange for those who were interested to become special associates, on a personal basis, of the B.S.I. The B.S.I. would extend its services of information about the application of standards and would provide a base for the organisation of national and regional meetings throughout the year.

This proposal was agreed to at the conference, and it was also agreed that a subscription of one guinea would be used to finance the administration of these activities. The membership and subscription would be on an individual basis and would, of course, be quite distinct from the normal subscription paid by firms to finance the B.S.I.'s work as a whole. Application forms for membership were available at the conference, and it was agreed that an inaugural meeting should be held in London on 8th July, when detailed plans would be considered.

Standards engineers unable to attend the conference and who wish to take advantage of these new facilities can obtain application forms from the British Standards Institution, 2, Park Street, London, W.I.

The final item on the agenda concerned the inch/metric issue in international standards, in particular means of promoting interchangeability of inch and metric sizes. In an introductory talk, Mr. T. R. B. Sanders (engineering adviser to the British Standards Institution) referred to the problems arising in relation to the Common Market and the European Free Trade Association.

#### **ELECTRICAL SAFETY**

THE annual lecture of the Utilisation Section of the Institution of Electrical Engineers was given on 5th May by Mr. S. J. Emerson, M.Eng., M.I.E.E., who spoke on "Safety in the Utilisation of Electricity." During 50 years, he said, total electrical accidents had barely doubled, despite an increase of nearly twenty-fold in the use of electricity; and in recent years there had been a fall in accident numbers although the increase in use was greater than ever before. Statutory Acts and Regulations dating back to 1882 were briefly reviewed, and it was shown that the Institution, through the work of its Wiring Regulations Committee, had exerted a most beneficial influence throughout. As a result the point was made that electricity was now the safest form of both industrial and domestic power.

Hazards, where they existed, fell under the following

headings:—(a) Electric shock and burns; (b) fire and explosion; (c) eye-flash and radiations. At the present time, when attention was focused on the national loss caused annually by fire, this risk was of special interest. Statistics were presented which clearly indicated that the number of fires from electrical causes was not rising at anything like the same rate as the total of all fires in buildings. The fire hazard from electrical causes was well under control; and the old cry, once so popular in the non-technical Press, that almost every unsolved fire was due to the "fusing of an electric wire" had now ceased to have significance.

A fairly high standard of equipment and installation practice had been built up, yet many accidents were caused by the injured persons taking unnecessary risks or failing to utilise the means provided for their safety. Hence such factors as human error and mental aberration on the part of the user called for most careful consideration by those seeking to ensure electrical safety.

# VIEWS on the NEWS

#### By REFLECTOR

ONE of the names enshrined in the language of electrical science is that of Wheatstone whose bridge is as well known as Euclid's pons asinorum. Charles Wheatstone's work was recalled at a recent ceremony at Gloucester (his native city) when a commemorative plaque, moved from St. Michael's Church tower to the Gloucester Technical College, was unveiled a second time. His chefd'œuvre (for which he was knighted) was the application of the electric telegraph in public service. It is a sad thought that, about a hundred years later, the public telegraph service has fallen into such serious financial straits as to make it doubtful whether it will continue for much longer.

\* \* \*

I have already made reference to the plight of the Ffestiniog Railway Company, part of whose narrow-gauge line is being submerged in a reservoir forming part of the Central Electricity Generating Board's Ffestiniog hydro-electric scheme. Last week a Lands Tribunal heard a claim by the company for compensation amounting to between £180,000 and £200,000 which, it says, is the expense in which it will be involved by the construction of a new section round the reservoir. I was particularly interested in the evidence given by Mr. F. Wayne, the secretary of the company. He insisted that they must persist in using steam locomotives. If they replaced them by diesels people would probably ask for their money back. According to The Times, Mr. Wayne added that there was a great awakening of interest in the narrow-gauge railway and soon it would be difficult to get a journey at all in a steam train and they might find quite a lot of people coming quite a long way to do that. Why not? There are still some people who make occasional dashes in four-in-hands.

\* \* \*

On several occasions I have tried to help the Central Electricity Generating Board to dispose of the fly ash from its power stations by drawing attention to its suitability as a building material or for other purposes. I did not realise, however, just how strong and good it is. A year or so ago an experimental embankment was built in Bedford to simulate a typical road section. This was about 10ft high and 15ft wide at the top and was constructed entirely of fly ash, with added water. After a period of inspection it was decided to demolish the embankment. A powerful bulldozer was brought along

but failed to make an impression and finally blasting had to be resorted to. Powell Duffryn, Ltd., from whom I derive this information, say that large quantities of fly ash have been used successfully as "fill" on AI road improvement schemes.

\* \* \*

Among those who attended last week's meeting of the London Electricity Consultative Council was Mr. J. C. George, Parliamentary Secretary, Ministry of Power, who in a short address spoke of the importance which the Minister, Mr. R. Wood, attached to the work of the Council and allied bodies in the field of consumer relations. I understand that the Minister and Mr. George are also to attend meetings of other Councils to hear at first hand something of their deliberations. One difficulty of the Councils is that of making their work known to the general public. Some are more successful than others in obtaining Press publicity but many consumers are still unaware of their existence. More could be done if the proceedings of district committees could be reported in the local Press. Another obstacle, to which Alderman W. J. Bennett, chairman of the Eastern Council, referred on Friday, is the rule relating to the publication of the annual reports. Announcing that the Eastern Council's report for 1959-60 had been considered that morning, he said it was not their wish that it could not be published; parliamentary procedure demanded that it could not be disclosed until it was laid before the House, in the autumn.

\* \* \*

Sixty years ago a Parliamentary Committee on electricity Bills promoted by private interests was reported by the *Electrical Review* (25th May, 1900) to have reached the following conclusion:—

"The value of electrical energy as a means for the transmission and application of power has been amply demonstrated, and its importance to the industries of this country is admitted. The Committee accordingly advise that it is of public advantage to facilitate measures which may ensure a general supply of electrical power to all consumers who may seek to avail themselves of the economy and efficiency offered in the service of these sources of application of power."

Of this rather verbose declaration the *Review* said:—
"We imagine this will take the heart out of some municipal opponents who have been occupying so much of the Committee's valuable time."

### LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

#### Floor Heating and Radiator Systems

I WAS agreeably surprised by the number of letters published in your last issue on the above subject; it obviously indicates an enormous interest in continuous electric central heating. Unfortunately, most of the writers give their personal experience of floor heating and they do not indicate what experience they have had of other forms of central heating.

May I remind your readers that my original letter of 16th March merely drew attention to Bulletin No. 453 issued by the University of Illinois on the performance of hot water floor heating systems following research work by Warren S. Harris and Everett L. Sartain in the Floor Slab Laboratory at the University, which indicated that a hot water floor heating system used approximately 10 per cent more fuel than a hot water radiator system.

I then made a plea for field tests so that architects and others concerned with new building should be in possession of reasonable comparisons between this or that form of continuous electric space heating. Surely it should be possible to arrange for a local authority to build, say, 50 houses with electric floor heating and another 50 houses on the same building site with oil-filled electric radiator systems under time switch and thermostatic control.

Even a field test as small as this, and appreciating that the habits of the occupants will vary, will indicate whether there is a difference in the standard of comfort and whether one system, in a whole winter, appears to be more expensive than another. Obviously, the bigger the field test the more likely are the results to be helpful. What I am grumbling about is that claims are made for this or that form of electric central heating and these claims cannot be related for comparison purposes.

As most of your readers know, the subject was discussed at a meeting of the Institute of Heating and Ventilating Engineers, and it was obvious at this meeting that there were very diverse views on the subject, and electric floor heating came in for a considerable amount of criticism by heating engineers who really had no axe to grind because they are usually prepared to quote for various forms of continuous space heating.

One can, of course, make a case for anything, and there is a place for every form of central heating, but it would be nice to know which is the best, just as we already know which is the most popular form of central heating using other fuels.

I think one can say with certainty that in Europe as a whole 95 per cent of continuous space heating is in the form of radiators tailored to window width effectively dealing with the cold air radiation from the glass, etc. As such an overwhelming majority of people consider this the most effective form of central heating it must

have some merit and there must be some merit in the electrical equivalent.

On a point of detail, electric radiator systems are just as low in capital cost as floor heating systems and we would again make the point that our experience seems to indicate that a radiator system uses about one-third less electricity with a higher standard of comfort.

I would again emphasise that we shall be most happy to co-operate with any organisation interested in carrying out field tests. We feel certain that results will be most interesting, and of considerable use to the electrical industry in pressing its claims for electric heating.

London, W.I.

A. C. HAZEL, Managing Director, Hurseal, Ltd.

#### **Power Convention Arrangements**

PARTICULARS of the arrangements and speakers for this year's British Electrical Power Convention (Bournemouth, 30th May to 2nd June) were given at a meeting in London on Monday, held under the auspices of the British Electrical Development Association. Mr. D. B. Irving, chairman of the E.D.A. Council, presided and introduced Viscount Chandos (chairman, Associated Electrical Industries, Ltd.), the Convention president.

Lord Chandos said that the Convention was an important occasion for the industry and delegates would be drawn from all sections. The reason for the selection of the theme "The New Horizon," he said, was that even with the efforts the industry had been making, the public was still perhaps not fully acquainted with the developments in the electrical world. He also stressed the ever-increasing part that electricity was going to play in the life of everyone in the next ten to twenty years. During the last five years, said the president, the electrical industry's exports had totalled £1,370 million and since the end of the war the total had exceeded £2,800 million. Nobody could doubt the importance of the electrical industry in our national economy, he said.

Mr. Irving thanked Lord Chandos and then introduced the authors of the papers to be read at the Convention, who were with him on the platform. These were the Hon. H. G. Nelson ("Electrical Manufacture"); Mr. C. R. King ("Electricity Supply"); and Mr. T. E. Daniel ("Electricity in the Home"). Mr. E. V. Small ("Electrical Export") was unfortunately unable to be present at the meeting.

#### British Standards Year Book

A NUMERICAL list and brief description of the British Standards current at 1st January this year is given in the Year Book for 1960, published by the British Standards Institution, 2, Park Street, London, W.I, price 15s. This 592-page Year Book gives details of British Standard Codes of Practice and also of publications of the International Organisation for Standardisation (I.S.O.), the International Electrotechnical Commission (I.E.C.) and the International Commission on Rules for the Approval of Electrical Equipment (C.E.E.) and lists the places where complete sets of British Standards are maintained for reference in the United Kingdom and abroad.

## INSULATION TESTS

Author's summary of a paper entitled "The Resistance of Sheet Insulation to Surface Discharges," by J. H. Mason, B.Sc., Ph.D., A.M.I.E.E., which was read before an ordinary meeting of the Institution of Electrical Engineers held on 12th May

ALTHOUGH it is known that discharges in electrical insulation are one of the commonest causes of failure, it is often impracticable to design equipment which is discharge free. It is then essential to use materials which will survive the required service conditions. The Electrical Research Association, in co-operation with the International Electrotechnical Commission, is investigating possible methods for predicting the life of insulation and for comparing the discharge resistance of materials under service conditions.

This information is not given by the traditional short-duration electric strength tests where failure is caused either by thermal instability or by rapid penetration by discharge channels. These results give little indication of resistance to erosion and chemical degradation by discharges which cause ultimate failure in service.\*

No single test can reproduce the behaviour of materials in all conditions of service, but frequency accelerated life tests, using the simple rod and plate electrodes shown in Fig. 1, give reproducible results and clear differentiation between materials. Tests to assess resistance to surface discharges have wider application than tests for internal discharges because:—

(a) The inception voltage and magnitude of surface discharges are determined primarily by the thickness and permittivity of the insulation, whereas the behaviour of internal discharges is greatly affected by the dimensions of the discharging cavity.

(b) Surface discharges are usually larger and more deleterious than internal discharges.

(c) Tests can be made on available sheet or film materials instead of special samples with cavities.

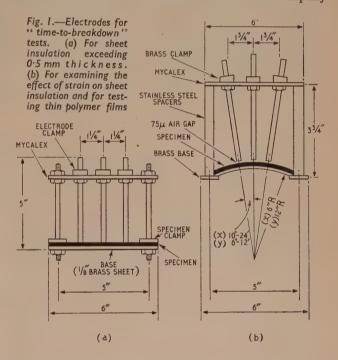
Dry air must be circulated over samples to prevent the formation of semiconducting surface films which affect the discharge magnitude and sometimes short-circuit discharges. Tests at 20°C can often be accelerated by raising the frequency to 500 c/s without affecting the life in cycles. Frequency acceleration may give misleading results at higher temperatures because, in some materials, a higher discharge frequency causes rapid failure by thermal instability at much lower stress than at 50 c/s.

#### "Time-to-Breakdown" Tests

Tests on silicone rubber, polythene, phenolic resin bonded paper, and on silicone-, epoxy- and melamine-impregnated glass laminates were carried out. Striking differences were found between different silicone glass laminates. Those with greatest discharge resistance were bonded with resin having a high phenyl content

which gives good adhesion to the glass fibre and is less liable to craze during cure than many other silicone resins. Laminates bonded with the latter suffered very rapid failure. Tests on eight different epoxy-glass laminates showed comparatively small differences in discharge resistance, and life/stress curves of similar slope for epoxy laminates of different thickness were obtained.

The discharge resistance of silicone-rubber and siliconeglass laminate is little affected by raising the temperature to 150°C, but other materials fail much more rapidly



at higher temperatures. Preliminary tests showed that micanite has greater resistance to discharges than any other material tested.

#### Mechanical Strain

Laminate samples, subjected to tensional strain by bending over the cylindrical low-voltage electrode of the apparatus shown in Fig. 1b, failed much more rapidly than unstrained samples. A silicone-glass laminate, 1.6 mm thick, failed in 260 hours, when subjected to 0.25 per cent strain, compared with 104 hours when unstrained at the same stress (60 kV/cm); and a 3.3 mm thick phenolic-bonded paper laminate failed in 18 hours at 45 kV/cm, compared with 400 hours when no strain was applied. Compressive strain on the samples exposed to discharges has no significant effect.

The electrodes shown in Fig. 1b were also used to test films of 0.5 to 8 mil thickness. The rod electrodes were

<sup>\*</sup>Mason, J. H. "Dielectric Breakdown in Solid Insulation," Chap. I. "Progress in Dielectrics," Vol. I, Edited by Birks & Schulmann. Heywood; London, 1959.

clamped 3 mil above the film to avoid possible mechanical damage. This gap did not significantly affect the relative discharge resistance of materials, but greatly reduced the scatter in results on soft materials. Life curves show that the relative discharge resistance of materials depends on the applied stress and ambient temperature, and on the specimen thickness.

The following classification is indicated: —

Polythene: the lower the melt index, the greater the discharge resistance. At 105°C the life of linear polythene is about 5 per cent of that at 20°C.

Polycarbonate—Makrafol: at 120°C the life is about

20 per cent of that at 20°C.

Polyethylene terephthalate—Melinex is more resistant than Mylar. At 120°C the life is about 70 per cent of that at 20°C.

Cellulose acetate: at 105°C the life is about 15 per cent of that at 20°C.

Polytetrafluorethylene—cast from dispersion: at 140°C

the life is about 50 per cent of that at 20°C.

Preliminary tests show that the life of polythene films subjected to a series of unidirectional voltage pulses is considerably greater than with the same peak alternating voltage. Positive pulses applied to the rod are less damaging than negative pulses.

#### **DISCUSSION**

Mr. P. R. Hartshorn suggested that two other properties of the material which must be taken into account besides its inherent tracking propensity were its resistance to water and its resistance to chemical attack. Using the intrinsic values which Dr. Mason had produced, and considering them in relation to the two other factors, they might well have a fair indication of what was to be expected with the material under actual service conditions.

M. Leroy said that improvements in methods for comparing the resistance of sheet insulation to breakdown by discharges was a hard study because of the many parameters involved. It seemed impossible to simulate all working conditions at the same time, and one had to select only a few. The choice of test conditions was of the utmost importance in getting results related to sub-

sequent service experience.

Mr. K. H. Stark said that he favoured the use of rods rather than point electrodes which had been proposed by Rowlandson three years previously and tended to give rather variable results as they invariably failed through the channels being eroded away by the discharges. He was not happy about the author's comments upon dry air. His experience with synthetic resin bonded paper and epoxy sheet film was that it did not make a great deal of difference whether one circulated dry air over them or not provided that the samples had reasonable access to the ambient air.

Mme. Fallou said that in France, in studying the same subject, they were using a test setting which appeared to behave in a quite different fashion, the electric discharges being uniformly distributed over the sample's surface. The area of the sample was wide enough to allow a number of different measurements to be performed during its ageing. She described the procedure with the French cells, in which plane electrodes were laid parallel to the sample, which was thus placed in an air gap in one or

other of the following arrangements: (1) an insulating plate, an air gap, the sample, and an insulating plate; (2) an air gap, the sample, and an insulating plate. It appeared that both methods might lead to the same classification of the insulating materials provided that one considered that the test ended with the first breakdown in both cases.

Two features of the second cell were of particular interest to the users. The first was that its plane symmetry allowed a uniform charge; thus, the regions broken down would be determined not by the cell's configuration but actually by the weak points of the sample, which was important in the case of heterogeneous insulation.

The second was that the insulating plate, being of high dielectric strength, allowed not a single discharge but a large number of discharges leading to breakdown of the insulating material to be recorded. The risk of taking into account accidental breakdowns was thus diminished. Also, the map of the broken down region was made avail-

able for inspection.

Mr. J. S. Simons said that his company, A.E.I. (Rugby), Ltd., was particularly interested in large h.v. machines, and in the laboratory they were very much concerned with devising functional methods for evaluating information for machines. They felt it desirable to include some erosion test to evaluate their insulation systems. Variations in atmospheric conditions were allowed. He described the use of a tungsten needle point electrode system and showed slides illustrating results.

M. Lang described the type of cell used by his company in France. The measurement circuit consisted of an impulse counter and a coulombmeter. The electrodes consisted, on the one hand, of a 3 mm dia-spherical cap and, on the other hand, of a 3 mm dia-cylindrical electrode. A neon tube indicated exactly when the puncture occurred. Preliminary tests showed that the number of coulombs was related to the mechanical wear of the insulation. Wear having a chemical origin should be considered with another type of cell. The number of coulombs required to break down a given thickness of insulation was independent of the frequency, the applied voltage and the thickness of the air gap.

Mr. W. P. Baker said that it might be asked why it was necessary at the present stage to present proposals for a test after nearly 100 years of electrical engineering. The question was how they could safely estimate lives of about 30 years which were required for installed capital equipment with non-traditional materials of which they had no experience. They could not wait 30 years to verify laboratory tests, and so some means of acceleration of tests became necessary.

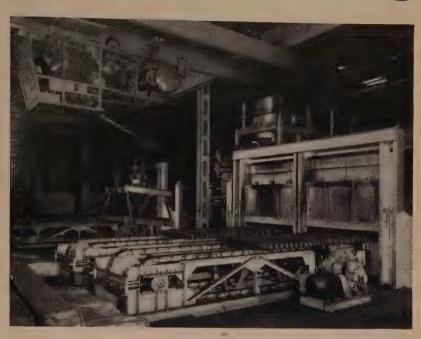
Mr. N. Parkman said that the criticism about the difference between service conditions and test conditions could be levelled at any accelerated test. There was no hope of ever getting rid of that criticism; one could only hope to minimise it. Some accelerated tests were very informative and gave the designer a great deal of guidance.

Mr. J. K. Wood asked whether results were available to show the relative resistance of solid glass to discharges, and said he would have liked information about the test being applied to "old-fashioned" materials and not the modern polymers so that comparisons could be made against known performances in service.

Dr. Mason briefly replied to the discussion.

# Copper Rod Rolling

A new copper rod rolling mill costing £1,500,000 has been installed in the Prescot works of British Insulated Callender's Cables, Ltd., and last week it was officially inaugurated by Mr. Reginald Maudling, President of the Board of Trade. With a normal production of 100,000 tons a year, the mill is fully automatic and can produce rod for drawing round wire or for rolling into strip



Wirebars being loaded into the twin reheating furnace

SINCE the beginning of the century the B.I.C.C. group has been engaged in the rolling of copper rod. Today, claimed to be the largest existing cable-making organisation, it accounts for nearly a quarter of this country's production of this commodity. The new No. 4 mill at Prescot is believed to be the largest and most modern rod rolling mill in the world and, operated by a crew of only 17 men, it will supply 75 per cent of the rod used by the British cable-making industry.

No. I mill was built at Prescot in 1900, followed by a second in 1915 and a third ten years later. All have been successively modernised and increased in speed of operation, but a point was reached when No. 3 mill became obsolescent and there was insufficient space to modernise it further. With the completion of No. 4 mill, which supersedes No. 3, a serious situation has been turned to advantage; No. I mill is still rolling heavyweight bars (between 400 and 500 lb) for railway electrification contracts, etc., No. 2 mill has been turned over to the rolling of aluminium rod, and a heavy burden has been lifted from No. 3 mill with its limited maximum capacity of 15 tons of coiled copper rod per hour.

The new mill is housed in a shop 520ft long, 104ft wide and with a total floor area (including the maintenance bay) of 72,000 sq ft. Adjacent to the shop there is a capacious open-air stockyard, 400ft by 100ft, which is served by two 6-ton cranes and has a capacity of 10,000 tons

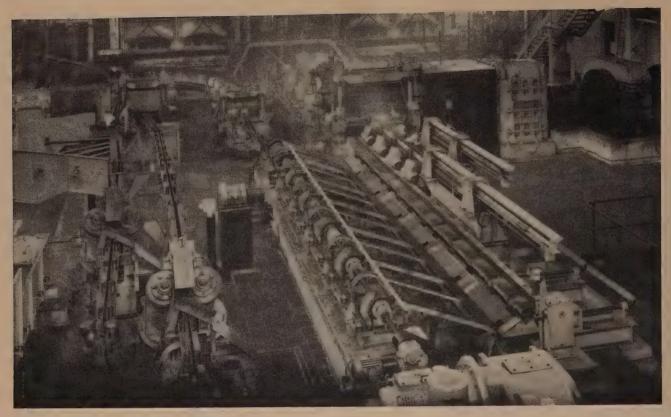
From the stockyard the 54in long, 265 lb wirebars are hauled in 43-ton lots on charge cars drawn by diesel locomotive to the charging area, or furnace end, of the mill. The charge cars are unloaded by two Herbert

Morris one-ton overhead travelling cranes (one for each furnace) which lift up the wirebars in rows of seven and transfer them as required on to one of the four furnace-charging conveyors.

An important feature of the new mill is that it is designed with two separate intermediate finishing and finishing trains. Rods of the same diameter or of two different sizes can therefore be rolled at the same time. The sizes of coiled rod diameter that can be rolled range in  $\frac{1}{16}$  in steps from  $\frac{1}{4}$  in to  $\frac{9}{16}$  in. At any instant there are seven wirebars moving simultaneously in the mill, about 13 sec out of phase on each side. An idea of the speed at which the rods are rolled may be gathered from the fact that a  $\frac{1}{4}$  in rod starting on its journey as a wirebar at 584ft/min emerges 95 sec later as a coil some 1,300ft long at a rate of 3,500ft/min.

This demanded the use of two furnaces, and two oil-fired walking beam units manufactured by the Wellman Smith Owen Engineering Corporation, Ltd., have been installed. There are two walking beams in each furnace, electrically controlled to operate consecutively. Delivery of wirebars to the walking beams is effected by conveyors, limit switches being employed to space the bars 3½ in apart. In the course of a complete cycle of the walking beam one bar is loaded automatically and another dropped on to the furnace discharge rollers.

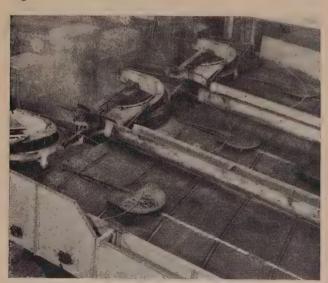
After being heated for one hour to 810-830°C, the wirebars are discharged at 13-sec intervals on rollers from the bottom end of alternate furnaces to a cruciform turntable between the furnaces. This turntable rotates backwards and forwards through 90° and its function is to receive and direct the wirebars for entry into the mill



General view of roughing mill mechanisation from the outgoing side

train. An operator pushes a button to begin operations and the first wirebar is discharged on rollers from a furnace; the turntable is rotated and the bar is conveyed along a single roller-driven guide trough to the first stand—No. I three-high (five-pass) 20in roughing mill.

The mill incorporates duplicated trains, and it consists of 29 stands of rolls disposed to impart 20 passes when rolling  $\frac{1}{4}$  in diameter rod. There are in effect two parallel systems so that, viewing the mill from the turntable, one sees in semi-plan form the single train leading to the roughing mill and thereafter two separate trains of stands to half-left and half-right, the right (or "B" train) being shorter because the layout is staggered. Running the length of the stands on the "A" side is an observation



Inter-stand repeaters on the intermediate finishing mill

balcony. From vantage points on this balcony it is possible to watch bars progressing through most of the "A" stands to the two finishing coilers.

On entering the roughing mill (12 sec after reaching the turntable) the bar is fed by an electro-pneumatic pusher through the first pass (12,427 sq in), raised on manipulating gear and pushed back again through two further passes (8.90 sq in and 5.63 sq in), manipulated up and sideways once more before being pushed through two subsequent passes (3.945 sq in and 2.50 sq in) and into position on a chain-driven side transfer table.

The rod emerges from the roughing mill 30ft long, the time taken so far being 30.45 sec. After being transferred sideways and deposited in the intermediate roughing train, the rod is conveyed between a set of pinch rolls, operated by a photo-electric cell, in a backward direction towards the 15in two-high two-stand intermediate roughing mill (stands 2 and 3).

There is speed variation at every stage in the mill. At the seven finishing stands, as a rod is rolled the rolls slow down initially, so boosters come into operation to raise the voltage and return the motor speed to normal.

Pass 6 (the first stand of the intermediate roughing mill) marks the beginning of the duplicate trains. Rods enter these trains alternately by means of an automatic switching device, loop in an anti-clockwise direction through 180° on a semi-circular tray (looping being necessary to accommodate the rapid increase in rod length) and emerge through a second stand of rolls (64.7ft long) in the direction of the finishing mills. This takes 44.65 sec after positioning on the turntable.

The immediate destination of the rod is now the first of the IIIn "cross-country" intermediate finishing mills which are of zig-zag formation and comprise six looping



One of the two continuous finishing mills

stands each. At this stage it is possible to observe rods accelerating through the six intermediate finishing stands, increasing in length to 429ft in a matter of 8.20 sec. The total time is now 67.45 sec.

Next the rod goes into the 9in seven-stand continuous finishing mill. It attains a speed of about 30ft/sec on entering the finishing mill, and in the 2 seconds it takes to reach the coiler it is accelerated to a speed roughly double this figure.

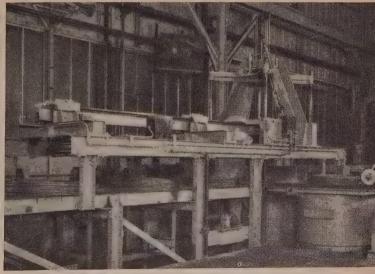
Cantilever-suspended multi-grooved 9in steel ring rolls are used and the stands are speed controlled automatically. To roll a ¼in rod all the seven passes of the finishing mill (that is, 20 passes in the complete rolling process) are employed; variation in roll centres is obtained by having one roller bearing mounted in an eccentric sleeve which can be rotated by hand-operated worm gear.

There are two pouring type coilers at the end of each finishing mill, situated one on each side of a quenching tank. Dogs on a conveyor remove the coils of rod from the quenching tank towards a mechanical fork lift at the end of the conveyor which then loads the coils on to a capstan. Each boom of the capstan will hold nine coils, and when it is fully loaded the capstan is rotated through 90° and unloaded by a stacker truck. The coils are finally taken to a large storage area at the end of the shop which is served by a 5-ton overhead travelling crane.

Flood lubrication by means of a solution of oil in water is used for all the roll grooves, roller guides, stripper gear and channels. This system consists of two 3,000 cu ft settling tanks and a sump, giving a total capacity of 60,000 gal in continuous circulation. Four pumps and one standby, each capable of delivering 600 gal/min, are used to circulate the solution which gravitates back to the settling tanks. A 1,000 gal mixing tank is provided.

The warmed water from the coil boshes overflows into settling sumps in the mill floor. Four pumps, one working and one standby per sump, are continually circulating the water at the rate of 15,400 gal/hr. A forced draught cooler incorporated in the closed system of pipework reduces the temperature of the water from 146° to 96°F. There is also a bypass spillway and coke filter to remove the finer solids in suspension.

All the pushing and pulling mechanisms in the mill are operated electro-pneumatically. Air for this purpose is obtained from a ring main supplied by two compressors and one standby unit. Each of these compressors is capable of delivering free air at 300 cu ft/min and 800 p.s.i. A 200 cu ft receiver is included in the line.



The rod coiler, coil quenching unit and discharge conveyor



General view of the main electrical control room

The motors were supplied by the English Electric Co., Ltd., and they are installed in the mill floor adjacent to the various roll stands and coilers. They have a total rating of 6,000 h.p. and the maximum power requirement for the plant is  $2\frac{1}{2}$  MVA. The roughing and intermediate roughing mills are each driven by a 6.2 kV, 600 h.p. slip-ring induction motor. The two intermediate finishing mills are split, each set of three stands being driven by a 500 V, 500 h.p. d.c. variable-speed motor. Each stand on the two continuous finishing mills is equipped with a 500 V, 100 h.p. d.c. variable-speed motor. The power for these 14 motors is provided by two English Electric 1,250 kW grid-controlled mercury-arc rectifiers, which also supply the motors for the intermediate finishing mill.

The four rod coilers are driven by variable-speed 65 h.p. d.c. motors which receive their power from two motor-generator sets. Each of these sets is independently controlled so that the speed of each pair of coilers can be set accurately for each size of rod.

The mill is controlled from three pulpits. There is a roughing mill pulpit and two identical finishing mill pulpits. A maintenance bay in the mill caters for stand assembly, guide assembly and roll storage. It includes facilities for storage and erection of the spare stand assemblies and the storage, grinding and assembling of such equipment as guides and strippers.

A two-storey extension block, 200ft long and 30ft wide, abuts centrally upon the "A" train side of the main mill building and, excluding the motors, contains all the electrical equipment for the mill, as well as office accommodation. In the basement are installed some 32 miles of B.I.C.C. cables, these consisting of p.v.c., armoured multi-core power cable, s.w.a. paper-insulated cable on the 6 kV a.c. supply, and butyl-rubber-insulated cable for the rectifier plant. The basement also accommodates

the ventilation plant which is pressurised by three motor-driven fans incorporating filters; further booster fans divert some of this air through ducts to cool the mill motors. Automatically controlled louvres allow the filtered air to pass from the basement into the equipment storeys above at a maximum rate of 55,000 cu ft/min. The air in the building proper is kept at the required temperature by automatically controlled heaters.

The ground floor of the extension block houses h.v. switchgear, main rectifiers, a.c. and d.c. distribution boards, liquid starters, magnetic amplifier control board, supervisory board, mill control boards and m.g. sets. The gallery equipment comprises a.c. and d.c. auxiliaries boards, roller rheostats, and coiler control boards. Power transformers, with a total rating of 1,500 kVA and B.I.C.C. power factor correction capacitors, are installed in bays adjacent to the electrical equipment building.

Quality control is exercised over the product by means of three separate tests. The first consists of measuring the temperature recording of the wirebars at the turntable. At present this is done with an optical pyrometer, but an optical pyrometer recorder is being installed. The second test, which is carried out at 5-min intervals on coils coming off the conveyors, maintains a micrometer check on cross-sectional areas. The third, the reverse torsion test, is performed on an electrically-operated machine in the laboratory. This puts ten turns on a sample of finished coil to determine the degree of oxide scale that may be present. By subsequently taking off the turns the surface is agitated and any rolling defects are detected.

The new rod mill was designed in collaboration with the Brightside Foundry & Engineering Co., Ltd., and installed by B.I.C.C. Much of the building construction work was carried out by Sir Alfred McAlpine & Son, Ltd.

# Radioisotopes

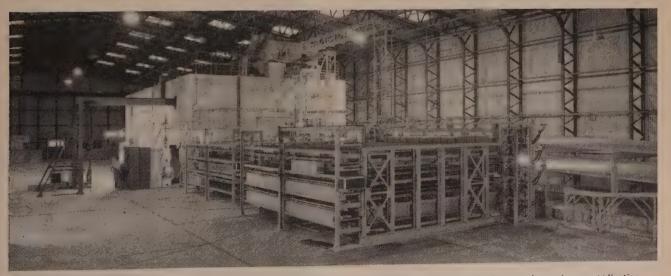
# THE WORK OF THE U.K.A.E.A. ISOTOPES RESEARCH DIVISION

HE development, production and marketing of radioactive isotopes for use in medicine, industry, agriculture and research is an important and expanding industry. Artificial radioisotopes are made by irradiation of the base element in a nuclear reactor. At present, relatively small quantities only are produced, but in the future, large amounts will be available as by-products from civil nuclear power stations. Three sections of the United Kingdom Atomic Energy Authority are at present concerned with radioisotopes. The radiation facilities are, of course, at Harwell and other Authority reactor establishments while the processing and marketing of the isotopes have been centred at the Radiochemical Centre at Amersham. An article describing the new extensions at Amersham was published in our last issue. The third section concerned with radioisotopes, the Isotopes Division of the U.K.A.E.A., was formed in 1948 for research and development of the isotopes which were produced by irradiation in BEPO. A further objective was to develop new techniques using radioisotopes and make them available to research and industry.

The Isotopes Division was originally at Harwell, but it has since been reconstituted as the Isotopes Research Division. The Division now occupies new premises at the Wantage Radiation Laboratories, which were officially opened last Monday by Lord Hailsham, the Minister for Science. Part of the work carried out at Wantage is on the useful employment of the large quantities of radioactive material which will become available as the result of the nuclear power programme. The Technological Irradiation Group has built a pilot scheme for studying

the commercial-scale use of intense radiation for the sterilisation of packaged items. The plant, which has been built at a cost of £100,000, will soon be undergoing commissioning trials. It consists of an irradiation chamber with 5ft 6in concrete shielding and an automatic conveyor system which permits continuous handling of standard packages (14in by 12in by 9in) from the bulk store through the chamber via a labyrinth passage and into the treated material store.

At present, the  $\gamma$ -ray source is in the form of a 7ft by 2ft rectangular frame containing 150,000 curies of cobalt 60 canned in stainless steel rods. The  $\gamma$ -ray energy emitted is absorbed by the object being irradiated; the amount being dependent on the time the object has been irradiated but the level of the dose absorbed is also dependent on the mass of the object. In a given time, a lightweight object would absorb a higher dose level than a heavier object. The radiation dose unit is called a "rad." One rad is equal to an energy absorption of 100 ergs/gm by the object. The 150,000 curies of cobalt 60 will provide 7 megaradtons/day (7.112×1014 ergs/day). Since a sterilising dose is of the order 2.5 megarads, the capacity of the plant will therefore be three tons of irradiated material per 24-hour day. If each package, which is approximately I cu ft in volume, contains 40 lb of material, then the plant can sterilise 168 packages per day or about 168 cu ft. These figures, of course, determine the speed of the conveyor system. This speed can be altered to give a range of doses from 100,000 rads to 5 megarads and the plant will in fact operate 24 hours per day to ensure full utilisation of the capital investment, particularly of the



The package irradiation plant at the Wantage Irradiation Laboratories. This facility will be used for large-scale continuous application of gamma rays for sterilisation of medical equipment and disinfestation of packaged products. Package storage racks of the conveyor system can be seen in the foreground and the source is contained within the concrete block

source. When not in use, the source is lowered into an 18ft deep water pond, which is also used for changing the spent rods. The entire system is duplicated, so that two sets of packages may be handled simultaneously to receive different doses. The cost of treating 1 cu ft of material with a dose of 2.5 megarads is in the region of 15s. This figure will be reduced in commercial package irradiation plants which will be designed for specific purposes. The design and construction of the mechanical handling and storage equipment was carried out by the Owen Organisation while the Atomic Energy Research Establishment at Harwell was responsible for the design of the source cell.

Other facilities used by the Technological Irradiation Group at Wantage include radiation cells for the experimental irradiation of batches of material weighing up to I cwt. The effects of radiation on living organisms in order of increasing doses are as follows: -Stimulation in growth; mutation; sterilisation; growth prevention; death; and chemical decomposition. Since these effects take place without appreciable rise in temperature, the sterilisation of tinned foodstuffs to increase shelf life is an obvious application and the effects of radiation on the quality, wholesomeness and nutritional value of several food items have been studied. No toxicity has been found in irradiated foods, but there is some nutritional damage. Another application being investigated is the direct control of insect pests by sterilisation. Principles of indirect control by sterile male release have also been investigated on the flour mill moth.

The Physics Group is investigating tracer applications and the development of radiation detectors. By labelling sand, shingle or silt with radioactive isotopes, the move-

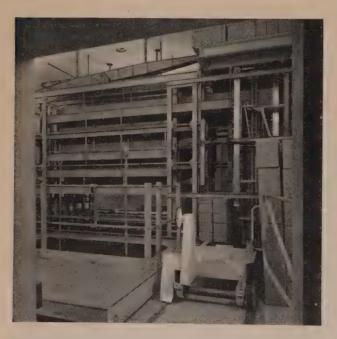
ment of these materials on the beds of rivers and on the seashore may be determined. For underwater experiments, special detectors have been constructed. Other research work concerns the detection of leaks in hermetically-sealed components, for example, submarine telephone repeaters. Components to be tested are immersed in an atmosphere of radioactive krypton at high pressure. After removal, the amount of krypton inside the sealed vessels, as determined by measuring the intensity of the radiation emitted, gives a quantitative indication of the size of any leak.

The Physics Group has also developed new methods of thickness gauging and analysis. Radioactive  $\gamma$ -ray and X-ray emitting isotopes provide a stable, portable and relatively cheap source of electromagnetic radiation without the need for high-voltage supplies and are now being used extensively for thickness and density measurements. There are, however, few long-lived sources emitting radiation in the important energy region below 100 keV and so  $\beta$ -excited sources of radiation have been developed.

Other work being carried out at Wantage includes the standardisation of radioactive materials and the use of cheap disposable medical equipment which can be irradiated and used once only.

#### HARWELL COURSE

A course for technical executives from the seventeen member countries of the O.E.E.C. will be held by the Harwell Reactor School from 4th to 15th July. Lectures given during the course will cover technical and economic aspects of nuclear energy and visits will be made to the Atomic Energy Establishments at Harwell and Winfrith. A visit will also be made to Hinkley Point.



View through the entrance to the cell of the package irradiation plant. When not in use, the source is stored in a pond below the conveyor racks

Interior of one of the cells used for the experimental irradiation of batches of material weighing up to 1 cwt. When in use, the radioactive cobalt is passed into the cell through the tubes





Exterior of the Electrolux refrigerator factory at Luton

UNDER the auspices of the Domestic Refrigeration Development Committee ("Dordec"), formed by ten of the leading British refrigerator makers, representing 90 per cent of the industry, a visit was paid last week to the Luton factory of Electrolux, Ltd. Here the first stage was recently completed of a £1\frac{3}{4}\$ million extension scheme which has raised the floor area from 600,000 to 700,000 sq ft. The second stage, expected to be finished by the end of the year, will add a further 120,000 sq ft. Nearby is the company's cleaner factory with 110,000 sq ft of floor space.

Coincident with the extension of the works the production lines have been reorganised to substitute flow production for some of the batch production previously carried out. Improvements in production methods and in mechanical handling have also been made.

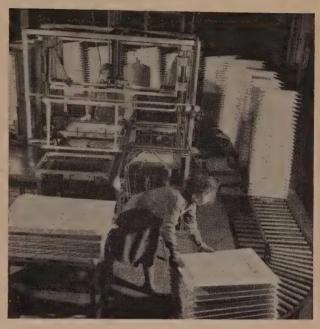
From the raw materials stores there are two production lines handling large and small models separately. These run independently until they meet at the final assembly lines. Electrolux refrigerators are all of the absorption type and the heart of the equipment is the absorption unit. Steel tubing from the stores is taken by stillages to a cooling unit shop by a new 3-ton gantry crane and after cleaning it is coiled on bending machines. The units thus formed are then carried by chain conveyors through the machine and welding flow lines. Components are added to the conveyors as they pass to the final welding point.

After assembly each absorption unit is given an initial leak test before going through an acid pickling plant and being hot-dip galvanised; it is then dipped in paint and stoved. Evacuation and filling with refrigerant follow and after final leak tests the boiler cases are filled with lagging and the units undergo operational tests.

At the same time the production of the cabinets is proceeding. The sheet steel outer casings and doors are formed in heavy power presses and the plastic linings are produced. The two lines come together and are joined by another conveyor system which brings up the finished absorption units for final assembly. At this stage

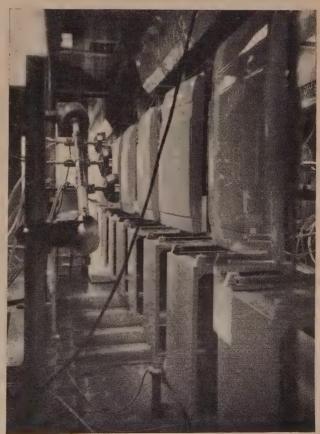
# Modern Refrigerator Factory

VISIT TO THE EXTENDED ELECTROLUX WORKS



Refrigerator door linings being formed from high-impact plastics

Electrostatic painting plant for coating cabinets and doors



the cabinets are lined with glass wool insulation and the shelves, radiator assemblies, ice trays and other fittings are put in. The completed refrigerators are then given a cabinet sealing test and a h.v. insulation test. After final inspection they are passed to the stores and dispatch section.

Special mention may be made of three new deep-draw vacuum moulding machines for producing plastic interior cabinet linings and the machines for forming complete door linings. Both types turn out mouldings of remarkably uniform thickness with the necessary projections and indentations in one operation.

Electrostatic application of finishing paint was another

ingenious process introduced some six years ago, but with this it was necessary first to hand-spray the priming coat on the cabinets. Recently the electrostatic method was adapted for the primer, too, and now the dual process is carried out in this way. The pieces to be treated are slowly conveyed through a chamber past sets of heads in which the paint is held and charged at about 100 kV. As the panels are of opposite polarity the charged paint particles "jump" across the intervening space and form an even, strongly adhering coating. As there is passage of paint particles only during the time that the panels are passing the heads there is no waste of paint.

#### RAILWAY MODERNISATION PROGRESS

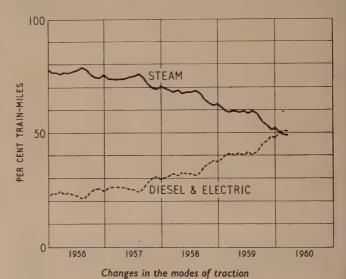
AT a Press conference last week Mr. John Ratter, a member of the British Transport Commission, reviewed the progress of the railway modernisation plan. It is now five years since the plan was published and results are now becoming apparent.

Much of the initial work, except for the partial completion of such big schemes as the Kent coast electrification and the introduction of diesel services in many areas, has necessarily been concentrated on the design and production of equipment. The replacement of steam traction by electric or diesel power is progressing rapidly, and the accompanying diagram shows that the total number of train-miles worked by diesel and electric traction is now greater than by steam locomotives. By 1961, the number of steam locomotives will be about 40 per cent less than in 1954. Also by the end of 1961, 80 per cent of British Railways' routes will be operated by diesel or electric power.

Last year 255 track-miles was electrified, bringing the total electrification to 2,914 track-miles. Work on about 200 route-miles of 25 kV a.c. electrification should be completed this year, i.e. the Manchester-Crewe, Glasgow suburban and London-Bishops Stortford lines. By the end of the year, it is expected that electrification work will be at an advanced stage on 280 route-miles, all of which should be completed in 1961. This includes the line between Liverpool and Crewe and the second stage of the main-line electrification which will ultimately reach London (Euston). It is hoped that electric train services will be in operation on the Liverpool-Crewe section by about the autumn of next year and so allow additional engineering resources to be concentrated on the next stage, from Crewe to Birmingham.

Among the diesel locomotives to be delivered during the year will be the first of the 3,300 h.p. English Electric "Deltics." Twenty-two of these locomotives are on order for the main line between London (King's Cross) and Edinburgh. They will replace 55 steam locomotives.

Track signalling has been improved in preparation for the higher speeds and the more frequent services with the new forms of traction. The standard of the permanent way has been raised on most routes and speeds of 90 m.p.h. are now permitted on the lines. Improvement to the permanent way is achieved by deeper ballast, better



drainage of the track and the installation of long welded rails and concrete sleepers. It is estimated that the whole of the main lines will be equipped with the automatic warning system by 1963. Another installation which will be completed by the last quarter of this year will be the Bank "Travolator" of the London Underground system.

Before the Press conference, a new British Transport film entitled "Report on Modernisation" was shown. It depicted the preliminary work being carried out on track improvements and also showed some of the research work, particularly that connected with transistor techniques applied to signalling.

#### **NEW I.C.E. PREMIUM**

THE Institution of Civil Engineers announces the establishment of the "Halcrow Bequest," provided for in the will of the late Sir William Halcrow, president in 1946-47, who died in 1958. It will take the form of an annual premium of £50 for award to the author of the best paper published by the Institution on specified subjects. These are docks and harbours, tunnels, and hydro-electric power—among subjects in which the late president was expert. Only corporate members of the Institution of Civil Engineers are eligible.

ELECTRICAL REVIEW
20 MAY 1960

969

PREVIEW OF
INTERNATIONAL SHOW
AT OLYMPIA



### I.E.A. EXHIBITION

NEXT Monday the third international Instruments, Electronics and Automation Exhibition will be officially opened by Lord Mills, Paymaster General and former Minister of Power. The Exhibition, which is being held in the Grand and National Halls at Olympia, will remain open until Saturday, 28th May, and our issue of 3rd June will contain an illustrated survey of the many interesting items displayed. This year's show is twice the size of its predecessors both in floor space and in the number of exhibitors. About 150,000 sq ft of floor space will be occupied by nearly 500 exhibitors, including over 100 foreign firms.

#### **Measuring Technique Developments**

Among the thousands of exhibits will be individual measuring and recording instruments, valves, semiconductor devices and electronic components, complete electronic control systems and data handling systems. Many of the exhibitors are showing laboratory instruments such as valve voltmeters, oscilloscopes and oscillators. A broad survey of these and many other instruments demonstrates the continued improvement in precision and in the extension of the field of measurement beyond formerly accepted limits. The application of nucleonic techniques to instrumentation will be demonstrated by instruments either using or detecting radiation. Those using radiation are mainly designed for the measuring of thickness, such as lacquer coatings on metal, or changes of level or density.

Individual items especially designed for incorporation in automatic control systems, such as transistorised counters, servo-motors, relays, three-term controllers, etc., will be seen, and a number of firms will demonstrate their use in complete automatic process control systems. Another essential ingredient in a completely automatic system is a computer, particularly the analogue type. Digital computers are also being shown by a number of firms.

The widest field for automatic control developed so far is perhaps that of materials handling in factories. This includes automatic weighing devices, sorting and counting equipment, and proportioning control of liquids and powders, as well as the transport of materials from one automatic process to another, either by conveyor or driverless trucks. In a fully integrated automatic production line, computers can be used to control complex sequences, provide the correct recipes and blend the mixtures of liquids or powders in the right order. This type of control can be both very flexible and accurate. Recipes can be altered easily and the whole process can be carried out with a far greater degree of accuracy of timing and measurement than under human control.

Continuous processes such as oil refining and the control of power stations can now be entirely operated by an automatic control system, and the inherent accuracy of these systems reduces the costs of production to an extent which outweighs the initial cost of the installation of the automatic system. Temperatures and pressures are measured and fed into simple computing elements which operate on the input signals according to simple formulæ. Output signals are then fed to proportional, integral and derivative controllers, which in turn vary the input more quickly and effectively than any human operator.

Apart from individual items of equipment used in overall control systems, examples of computer-controlled machine tools will also be seen at Olympia. These types of machine involve the translation of the engineering drawings of the component into a punched tape system. Automatic processes for offices which are mainly concerned with wage calculations and stores control will also be demonstrated. Another field in which electronic techniques are becoming more employed is medicine. Radio apparatus, which can detect temperature and pressure values and transmit the readings, has been designed in the form of a "pill" which can be swallowed by the patient.

During the Exhibition, a three-day conference (24th to 26th May) will be held in the Pillar Hall at Olympia. This conference is being organised by the Electrical Forum for Industry and is entitled "User Experience of Electronics in Industry." The first day will be devoted to electronics and data processing, and four papers will be given covering applications to maintenance stores, production control, insurance records and stock control. Electronics in factory applications will be the subject of the four papers to be read on 25th May. The final day will be concerned with instrumentation, continuous control of machines and remote control and telemetering.

#### INDUSTRIAL NEWS

#### **Design Centre Awards**

The Duke of Edinburgh visited the Design Centre, London, on 19th May, to present certificates to the manufacturers whose products have gained Design Centre awards. He also announced the winner of the Duke of Edinburgh Prize for Elegant Design, 1960, and presented the prize to last year's winner of the award, Mr. C. W. F. Longman, for his design of the Prestcold "Packaway" refrigerator.

Among the items receiving awards were street lighting columns and lanterns made by Abacus Engineering, Ltd., for Atlas Lighting, Ltd., lighting fittings ("Chelsea" range), and a low voltage display fitting made by Atlas Lighting, Ltd.—all three items were



A street lighting column of Atlas Lighting, Ltd., which has received a Design Centre award

designed by Richard Stevens, B.Sc., M.S.I.A., Dip.M.I.E.S., with Peter Todd.

#### **Publicity Overseas by Radio**

Though advertising is excluded from the B.B.C.'s programmes in this country, it is not perhaps sufficiently well known that firms and products are regularly identified by name when mentioned Corporation's in the External Services. By supplying information to the B.B.C. a firm may obtain useful publicity overseas and at the same time help the Corporation in its important task of telling the world about British industrial, scientific and technological achievements.

A description of these broadcasts, which are made in English and thirty-eight other languages, is contained in a new booklet, "British Industry and the External Services of the B.B.C." It explains what information and facilities are needed to prepare such broadcasts and lists the addresses to which information should be sent.

#### A.S.E.E. Exhibitors' Meeting

The annual meeting of exhibitors of the Electrical Engineers' Exhibition was held at the Caxton Hall on 12th May. Mr. R. F. Mathieson, chairman, briefly remarked on the success of the 1960 show and thanked exhibitors for their help in providing information for advance publicity purposes. He also paid tribute to the splendid support of the Press, particularly the Technical Press.

As in previous years, the most important point raised by various exhibitors at the meeting was the question of some form of sectionalisation, and although the body of opinion in the hall seemed to be against this, the chairman said that the final decision would depend on the result of a postal ballot in which all exhibitors would be asked to participate. Two announcements made at the meeting were that rising costs may necessitate a slight increase in space charges (unchanged since 1957) and a donation of 400 guineas was again being made by the Exhibition Company to the Electrical Industries Benevolent Association.

#### Appliance Prospects in Canada

A discouraging picture of the opportunities for selling British domestic electrical appliances in Canada is given in a 5,000-word article in the Board of Trade's Export Service Bulletin Weekly Supplement for 9th May.

The survey, which does not cover vacuum cleaners, is presented as an "introduction" to its subject, rather than as the usual market report in this series, because of the wide field covered; the nature of the demand is too different from that in the United Kingdom; the detail of such statistics as are available is insufficiently complete; and the market is made too turbulent by fierce competition.

The suggestion is tempting, the article states, that the market for domestic electrical appliances in Canada is too difficult to encourage exports from the United Kingdom. "But this would be wrong, for although

there are no immediate opportunities obviously available, and although an attack on a wide front might be foolhardy, one or two United Kingdom manufacturers have found particular small areas for infiltration, and ingenuity and determination might possibly establish more."

Information is given about the extent and nature of the market, the types of appliances found in Canadian houses, and where they have come from. There is also advice on standards requirements and methods of merchandising. Resale price maintenance is illegal in Canada and prices are generally low.

#### Transformers for the Admiralty

Foster Transformers, a company in the Metal Industries Group, has received a contract valued at £64,000 from the Admiralty for 40 self-regulating 500 kVA transformers with Statter circuit-breakers type M3 for shore-to-ship supplies in H.M. Dockyards.

### Battery Chargers for Port of London

The increasing use of battery electric forklift and platform trucks for moving goods and stores in the Port of London has resulted in the recent completion by the Westinghouse Brake & Signal Co., Ltd., of an installation of six two-rate vehicle battery chargers. with a d.c. output of 8.6 kW each, at the West India Dock. In addition the Port of London Authority has placed an order for a special installation of six double circuit two-rate chargers at the Royal Victoria Docks. These will be housed in large cubicles within the dockside building and remote control panels let into the outside wall will allow charging of batteries without the trucks entering the building.

Scruttons, Ltd., Port of London, has also ordered from Westinghouse a vehicle battery charger for servicing its electric trucks. This fully automatic equipment will charge up to twenty truck batteries, the charging current being adjustable up to 600 A with a total d.c. output of 29 kW.

#### **Electrical Industries Club**

About 120 members and guests attended the monthly luncheon meeting of the Electrical Industries Club at the Connaught Rooms, London, on 12th May. Mr. C. Robertson King, immediate past president, was in the chair in the absence of Col. B. H. Leeson, the newly-elected president,

who was, unfortunately, unable to attend because of a slight injury sustained as a result of a fall at his home. The guest speaker was Mr. Russell Braddon, author of such well-known books as "Cheshire, V.C." and "The Naked Island," whose talk, "An Australian looking at England," was full of humour and wit. After a vote of thanks had been accorded to Mr. Braddon it was announced that the next meeting would be on Tuesday, 14th June; the speaker will be Lord Citrine.

#### Switchgear Export Orders

The A.E.I. Switchgear Division has received two contracts for air-blast circuit-breakers for Mexico and New Zealand. Through the A.E.I. agents in Mexico, Lic Javier O. Aragon, six 250 kV 5,000 MVA air-blast circuit-breakers are to be supplied for the step-up substation at the hydro-electric plant of the Comision Federal de Electricidad Mazatapec.

The New Zealand order, placed by the New Zealand Electricity Department and received through Associated Electrical Industries (N.Z.), Ltd., is for eight 220 kV 7,500 MVA air-blast circuit-breakers for Maraetai I and II power stations in the North Island. They will be the first 220 kV breakers supplied to New Zealand by a British manufacturer. The equipment for both orders will be manufactured at the A.E.I. Switchgear Division's Willesden Works.

#### E.M.I. Demonstration Unit

The mobile demonstration unit, equipped by E.M.I. Electronics, Ltd., with its latest machine tool control systems and other automation aids, left the United Kingdom last week for a tour of Eastern Europe, where it will visit the Budapest and Poznan Fairs.

### Analogue Computer for Vehicle Design

A type 955 analogue computer has been ordered from the Electronic Apparatus Division of A.E.I., Ltd., by the Ford Motor Co., Ltd., Engineering Research, Birmingham, for investigating many aspects of motor vehicle design. The computer contains ninetytwo computing amplifiers, sixty for linear transfers and the remainder to be used in conjunction with simple non-linearalities such as limit and dead space, and with six 20-segment function generators. Other non-linear units in the installation are six 5-gang servo-multipliers, and two high-speed Hall effect multipliers. The equipment is contained in four double-bay cubicles and the control, measurement and display facilities are in a separate console.



The main entrance to S. N. Bridges' new works at Battersea

The computer can be used continuously or repetitively, and the controls are integral with the display of solutions on a dual trace oscilloscope which shows measurements of amplitude and time to an accuracy of  $\pm 0.5$  per cent. Facilities are available to put the computer into the hold condition after any pre-selected time or at any pre-selected problem voltage. A digital voltmeter is used for accurate setting of transfer coefficients and a two-channel pen recorder supplies a permanent record of results.

#### **New Portable Tool Factory**

The new factory and offices of S. N. Bridges & Co., Ltd., at York Road, Battersea, were opened by the chairman of the company, Lord Aberconway, last week. In a speech of welcome, Mr. G. N. Bridges, managing director, spoke of his concern at the materials supply position which was deteriorating rapidly. This affected not only sheet steel and die-castings but also board for cartons. He claimed that half the  $1\frac{1}{2}$  million power drills in British homes had been made by Bridges. They had the dominant share of the most difficult European market -Switzerland-and the largest share of any single manufacturer in practically every other European country.

He said that in his visits to Continental trade fairs he was embarrassed by the ineffectual way in which many leading U.K. firms were represented. The British Trade Fair which the Federation of British Industries and the Board of Trade were planning to hold in Sweden in 1962 would be two years too late. Mr. Bridges said that the German Economic Minister's plea for early negotiations between the "Six" and the "Seven" should be acted on immediately.

The new factory is on the site of the Belmont Works of Price's Patent Candle Company. It was decided to convert the existing office block, which forms the frontage along York Road, and to demolish the rest of the works. So far a north and a south wing have

been built. The north wing contains the machine shop, assembly line, dispatch department and the main entrance. The south wing contains the service department on the ground floor and a spacious restaurant above. During the next three years the space between the two wings will be built over and at a later stage the works will be extended down to the Thames. When building is completed there will be over 600,000 sq ft of production space. A unique feature of the site is that it includes the London Heliport, and when the helicopter services are extended in the future visitors will be able to travel by air right to the factory doorstep.

The company was started by Mr. G. N. Bridges in 1941, but it was not until 1948, when an interest in the company was acquired by John Brown & Co., Ltd., that the production of electric power tools was started.

#### **Hotel Ballroom Lighting**

The new Keirby Hotel, Burnley, constructed at a cost of £250,000, has several interesting features, including an unusual type of ceiling lighting in the ballroom. This ceiling, which has been made into a representation of the sky at night, is believed to be the only one of its kind in the country, the idea having been evolved by Mr. A. Ferguson, of the architect's staff, from observations at the London Planetarium.

It has over 800 m.e.s. lamps formed into 40 different constellations of stars switched in ten different sequences. The lamps operate at 6 V a.c. through a 250 VA continuous rated transformer. The sequences of the constellation can be operated either manually by switches or automatically by a motor-driven switching drum giving each constellation an illumination time of six minutes. The ceiling background has a midnight-blue flock finish.

The remainder of the ballroom lighting consists of perimeter lighting and eight large handwrought coloured "Chelsea" glassware pendants. To

vary the intensity of light when necessary, the lighting is connected through sliding dimmers.

A separate 150 kVA t.p. and n. supply has been provided in the control room at the rear of the ballroom, for television outside broadcasting units and 2in under-floor conduits have been installed throughout the ballroom with access traps so that the respective cables for the special lighting do not constitute a hazard.

Provision has been made for speech and music amplification from any point in the ballroom.

#### Railway Cable Contract

The A.E.I. Construction (Cables and Lines) Division has commenced work on a new railway cable contract awarded by the British Transport Commission. The contract, valued at over £150,000, covers the supply, supervision of laying, jointing, etc., of some 24 miles of 33 kV 3-core oilfilled cable with aluminium conductors along various sections of the main London to Brighton line. The contract also includes the supply, supervision of laying and jointing of a new 12-core plastic pilot/supervisory cable along most of the route, and the supervision of the transferring of existing pilot cables from the wooden trunking in which they are at present laid to the new surface concrete troughing.

#### Electricity "Quiz" Competition

The national final of the Electricity "Quiz" Competition, organised by the Electrical Development Association for the National Union of Townswomen's Guilds, will be held on 25th May at the Royal Albert Hall, London, commencing at 7.30 p.m. The competition will be preceded by halfan-hour of light music. Sir Edwin Herbert, president of the E.D.A., will preside and Lady Dorothy Macmillan will present the prizes. Mr. F. Engelmann and Mr. P. West, will act as question master and compère respectively.

#### Schoolboys' Exhibition, Glasgow

At the recent Schoolboys' Exhibition in Glasgow, the South of Scotland Electricity Board's stand was in the form of a cinema featuring an electricity "quiz." The children were invited to answer six questions based on pictures projected on the screen. Three kinds of pictures were shown—the trick picture, e.g. an electrical appliance, photographed from an unusual angle, which the children had to identify; a housewife using some appliance about which a question was posed; and questions about electrical

terms and consumption of appliances and their correct use. Over 16,000 children took part during the eleven days of the show.

A section of the stand was devoted to models and illuminated photographs of the Board's more important generating stations.

#### **Durgapur Steel Project Progress**

With the commissioning of the 42in blooming mill, Associated Electrical Industries, Ltd., Heavy Plant Division, has completed the supply and installation of the electrical equipment for the first of the primary mills in Stage II of the Durgapur steel project, which includes the steelmaking and the production of ingots for the primary mills.

The twin drive for the 42in bloom mill consists of two d.c. motors, each of 3,000 h.p., developing a combined peak of 15,000 h.p., the normal speed range being of 40/80 r.p.m. The main mill motors are supplied by a flywheel m.g. set consisting of four 1,200 kW and two 480 kW generators driven by a 5,000 h.p. induction motor. The flywheel has a stored energy capacity of 200,000 h.p.-seconds. The 1,200 kW generators supply the main drive (two generators for each motor) and the 480 kW generators supply the bloom shear motors.

#### **Automatic Blanket**

It is announced that the electrically-heated "automatic blanket," a description of which appeared in our 8th April issue (p. 718), is to be manufactured in this country by Monogram Electric, Ltd., at Crawley, Sussex. Sales facilities will be based both at Crawley and at the company's head-quarters at Lincoln House, 296-302, High Holborn, London, W.C.I.

#### **Works Visit**

The Electrical Committee of the Engineering Equipment Users' Association visited the Birmingham Works of George Ellison, Ltd., on 11th May to see a demonstration short circuit test on an Ellison 400 A fuse-switch with 200 A fuse links. The test witnessed was at 440 V 35 MVA (46,000 A) and was carried out in the company's A.S.T.A. authorised testing station. Technical details of the fuse-switchgear were explained to the visitors with the aid of a 16 mm sound film in colour, produced by the Ellison film unit.

#### Course for Wholesalers

The first of a series of two-day courses for sales representatives from electrical wholesalers was held on 11th and 12th May, when representatives

from Edmundsons Electrical Wholesalers, Ltd., Halsey's Electric Co., Ltd., the London Electrical Co. (Blackfriars), Ltd., and the National Electric Supplies Co., Ltd., were guests of the Benjamin Electric, Ltd., who are organising these courses at their Tottenham Works. Representatives from A.E.I. (Woolwich), Ltd., Crompton Parkinson, Ltd., and the General Electric Co., Ltd., also attended. The basic purpose of these courses is to provide facilities for seeing the manufacture of all types of industrial and commercial lighting fittings; to discuss the problems and technicalities of illumination; co-operation in the field; industrial lighting application; and the selling of quality lighting.

On the second day Mr. A. E. Iliffe (chairman, Benjamin Electric), Mr. J. O. K. Purdey (sales director) and Benjamin personnel gave various talks.

#### "Blue Book"

Except that the general index is this year at the back of the volume, the arrangement of the 1960 edition of the Electrical Trades Directory, the Electrical Journal "Blue Book," is similar to that of previous editions. It has been considerably enlarged and many more pages have been added. The directory is made up of eleven sections, covering the various branches of the electrical industry and products. In the products and materials section the number of headings has been considerably increased and the growth of the applications of electronic devices is reflected in the number of manufacturers whose names appear under new headings. The directory also includes some 7,000 trade names. It is published by Benn Brothers, Ltd., Bouverie House, 154, Fleet Street, London, E.C.4 (price 63s, plus carriage 3s).

#### Trade Announcements

Wm. Geipel, Ltd., announce that Mr. J. M. Anderson is taking over from Mr. Burns the Scottish agency for rubber and thermoplastic cables and electrical control gear. His address is 43, Church Road, Giffnock, Renfrewshire (telephone 3270). Mr. Burns will continue to assist him. Mr. L. Scull has been appointed to represent the company in South Yorkshire, North Midlands and Lincolnshire. His address is 94, Dane Thorpe Vale, Sherwood, Nottingham (telephone 26-2198).

Crater Products, Ltd., Woking, reports excellent progress towards re-establishing full production after a fire on 20th April which destroyed the whole of the assembly and finished stores building. The new replacement

building should be in full use by next month. It will take another week or two to get back to normal.

Merseyside Engineering (Refrigeration), Ltd., has appointed Mr. A. W. Sinclair as director of sales, Mr. J. Bayes as technical sales manager (Electricity Boards), and Mr. E. Wood as retail sales manager.

The Plessey Co., Ltd., announces that as a result of an agreement concluded with the Fansteel Metallurgical Corporation, of North Chicago, Illinois, it now has the exclusive selling rights in Great Britain of the range of Fansteel tantalum capacitors.

With reference to the change of address of S.L.R. Electric, Ltd., reported in our last issue, we have since been informed that while the Sales Department and showroom will be at Welbeck Works, Welbeck Road, South Harrow, Middx., the head office and

accounts will move on 27th May to the new works at Cranbourne Industrial Estate, Cranbourne Road, Potters Bar, Middx.

**Dulrae, Ltd.,** has moved to Spur Road, North Feltham Trading Estate, Feltham, Middx. (telephone: Feltham 5052).

A number of new appointments are announced by the Midlands Region of Philips Electrical, Ltd. Mr. M. J. Wells, at present a lighting engineer, becomes applications engineer for the whole region. Mr. R. J. Flitt, a lighting representative in the Wolverhampton and Staffordshire area, has been appointed sales engineer with particular responsibility for street lighting business. Mr. D. C. Matthews has joined the company as a lighting representative for the area previously covered by Mr. Flitt. Mr. G. F. Walkeden, at present a "Philishave"

service promoter, becomes lamp and lighting representative for a territory in central Birmingham.

Philco (Gt. Britain), Ltd., announce the appointment of Mr. R. Jones as representative for Northumberland and County Durham. His home address is "Elim," Market Lane, Swalwell, Newcastle-upon-Tyne.

As from 1st June the telephone number of the British Insulated Callender's Cables, Ltd., Liverpool branch will be changed to Maritime 2424.

Polypenco, Ltd., 68-70, Tewin Road, Welwyn Garden City, Herts., manufacturers of engineering industrial plastics, have recently established a new sales office at 117, Swan Arcade, Bradford, I (telephone: Bradford 32073), under the management of Mr. S. Sharp.

### E.D.A. Public Speaking Competition

THE finals of the E.D.A. Public Speaking Competition were held on Wednesday and Thursday last week at the Connaught Rooms, London, twelve men and twelve women from the Electricity Boards taking part.

Miss Valerie M. Hill, a demonstrator in the Rotherham District of the Yorkshire Board, won the Faraday Silver Challenge Shield, with a speech on "Value for Money." Second place went to Miss Carole A. Hockridge, a shorthand-typist in the Bude offices of the South Western Electricity Board, with an address on "A Day to Remember." There was a tie for third place between Miss Gillian P. Dunn, showroom assistant, South Eastern

Board, Wallington (who spoke on "First Impressions"), and Mrs. Dorothy Vaughan, service centre assistant, South of Scotland Board, Castle Douglas (whose subject was "Down on the Farm"). It is the third time that the Yorkshire Board has won the women's shield.

The South Western Electricity Board gained the men's shield—the third time they have done so—Mr. W. A. Wren, a service centre assistant in charge of the Plympton Service Centre, being the winner with an address on "A Refrigeration Story (Electricity and Health)." Second place went to Mr. J. F. Grierson, first assistant district commercial engineer,

North District, North Western Electricity Board, who spoke on "Electricity and Health." Mr. G. Oddy, a sales representative in the Halifax District of the Yorkshire Electricity Board, was third. He chose as his subject "Farming—By Wire."

The judging was shared between Miss A. S. Lockhart (E.A.W.), Mr. Frank Phillips (B.B.C.), Mr. D. J. Bolton and Mr. J. I. Bernard (director and secretary of E.D.A.). Mr. Bernard acted as chairman of the contest and presented the winners with their awards on the men's day, and Mr. J. A. Stedman (education officer, E.D.A.) carried out these duties for the women's section.





The left-hand picture shows (left to right) Miss Valerie M. Hill, winner of the shield in the women's section of the E.D.A. Public Speaking Competition, Miss Carole A. Hockridge (second), Miss Gillian P. Dunn and Mrs. Dorothy Vaughan (joint third). On the right (left to right) are Mr. W. A. Wren, winner of the men's shield, Mr. J. F. Grierson (second) and Mr. G. Oddy (third)

## Lighting Problems and Progress

I.E.S. SUMMER MEETING AT HARROGATE

The Illuminating Engineering Society held its biennial summer meeting at Harrogate from Sunday to Wednesday of this week. An innovation this year was the reduction in the number of formal papers to three and the devotion of one day to the group study and discussion of six subjects of topical interest now being considered by the Society's technical committee. The aim has been to make the summer meeting a serious working conference at which individual lighting engineers and the lighting industry as a whole can get to grips with current problems.

The three formal papers, and the discussions on the first two, are summarised below; a report of the concluding sessions will be published next week

**Electric Lamp Developments** 

THE entirely new method of converting electrical energy into light by electroluminescence has not fulfilled its early promise. On the other hand, at a time when progress in conventional discharge sources might reasonably be expected to have levelled off, new ideas have evolved and substantial improvements have been made. In his paper "Progress in the Field of Electric Lamps" Mr. H. G. Jenkins, M.Sc., F.Inst.P. (G.E.C. Research Laboratories) discussed the more important current developments in electric lamps and indicated what might be commercially possible in the future.

Great advances in lamp-making technology, and particularly in capping cements, had made possible substantial reductions in bulb sizes of general lighting service and decorative tungsten lamps, without detriment to performance; the ultimate in this direction had not yet been reached. The practical limitations on reduced bulb size were now determined by the economics of the lighting

fittings, lampholders and cable. Changes in shape were largely determined by æsthetic appeal.

Recent developments in projector lamps were important because of a new approach to the relation between the light source and its optics. Whereas previously the lamp and the optical system in which it was used had been separate components, lamps were now being introduced which had their own parabolic or elliptical section reflectors. Associated with these developments there was also an important trend towards low-voltage (8 to 20 V) lamps which made possible a thick and robust filament with associated advantages of compactness and higher luminance.

Perhaps the most important development in filament lamps of recent years was, Mr. Jenkins continued, the deliberate use of chemical mechanisms in the lamp to improve lamp performance. The use of the tungsteniodine cycle, with quartz envelopes, offered extremely small, high-brightness lamps of outstanding performance for 8 mm and 16 mm ciné projection (Fig. 1). Quartz tubular iodine lamps of higher wattage could be used for many floodlighting applications, where they would give, in addition to a better performance, marked advantages in size and cost of fitting. Mr. Jenkins also thought this development might affect their thoughts in the field of tungsten ballasted high-pressure mercury lamps.

Although there had been continuous improvement in almost every aspect of lamp quality, much still remained to be done to improve the uniformity of lamp performance. The magnitude of the problem was apparent when it was realised that a change of only I per cent in the diameter of wire in the length of a single filament, could reduce lamp life by over 25 per cent compared to that using a perfectly uniform wire. A substitute for tungsten was unlikely in the near future.

The high efficiencies of fluorescent lamps were now taken for granted, but Mr. Jenkins described some of the developments in progress which would lead to further improvements and contribute at the same time to a more constant product. The gain in the average efficiency



A feature of this year's summer meeting has been the floodlighting of Fountains Abbey. Fluorescent tubes in green, blue and gold, along the base of a cliff, and the floodlighting of distant trees, combine to create the view of the Abbey above, while the nave (right) is lit by eleven twintube fluorescent fittings suspended vertically against the wall



throughout the life of the lamp, now usually taken as the efficiency after 2,000 hours' burning, had been more marked than the gain in initial efficiency. This was the figure that really mattered to the user and in the ideal lamp would be no lower than the initial value. Though the better luminous performance had arisen mainly from a steady improvement in the quality and particle size of distribution of the fluorescent powder, this would have had little effect without corresponding improvements in manufacturing processes and equipment.

Although the major part of the light from a fluorescent tube came from the fluorescent coating something like to per cent came from the mercury vapour discharge. By the use of double coated lamps, in which the coating in contact with the tube wall acted as a filter for the blue mercury lines, it was possible to reproduce fairly accurately the colour appearance and rendering characteristics of both low- and high-temperature tungsten

filament lamps.

Apart from colour another constant problem was that of getting a higher loading into a given length. According to Mr. Jenkins, however, the life and luminous performance of the highly loaded lamps that had been marketed in America and Europe were poorer than that obtained with normal tubes. A fully satisfactory solution of the problems associated with higher loading had not yet been found. Another method was to increase the concentration by making the long discharge source follow a zig-zag or spiral course (Fig. 2). Though expensive to manufacture, such tubes might have a greater attraction in the home.

The most interesting new circuit development was the germanium transistor invertor for use in vehicles. Mr. Jenkins thought that a silicon-controlled rectifier might be developed to operate in a frequency-changer circuit giving, say, a 10,000 c/s output from a 50 c/s input. Such an arrangement might make high-frequency operation, with its attendant advantages of cheap, lightweight control gear, freedom from stroboscopic flicker and improved lamp efficiency, a practical proposition.

The most important developments in the high-pressure mercury vapour lamp had been concerned with the utilisation of the ultra-violet energy by means of fluorescence to improve colour and efficiency. In an interesting new h.p.m.v. lamp for ciné projection the discharge was

Fig. 1.—Experimental 12 V 100 W quartz-iodine projector lamp compared with conventional lamp



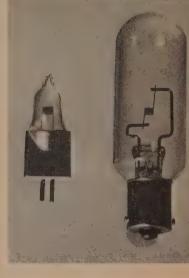


Fig. 2. — Experimental compact fluorescent lamps



pulsed in synchronism with the moving film. Though the chief attraction of the sodium lamp was its high efficiency there was still much scope for further gains, and great ingenuity was being shown in lamp design and construction. It was uncertain, Mr. Jenkins thought, whether xenon lamps could ever compete for general purposes with the simpler and cheaper tungsten filament lamps, with their warmer colour and comparable luminous efficiency.

#### Assessing Illumination Levels

"MERE multiplicity of 'factors' to allow for this and that will not necessarily make an illumination specification system more 'scientific,' it may make it less so and may introduce a cumulative error that lowers the status of the end product to that of a guess. Whether one system is 'truer' than another in the practical sense must be judged by differences of results."

This was stated by Mr. H. C. Weston, O.B.E., F.I.E.S. (Atlas Lighting, Ltd.), in his paper "Rationally Recommended Illumination Levels." He put forward proposals for simplifying the procedure for assessing the amount of light required for any particular purpose, at the same time enabling the lighting engineer to make a more accurate assessment, and thus provide installations which would

reduce fatigue and increase efficiency. The proposals made by Mr. Weston were, as he pointed out, no more than modifications of those he put forward in 1943.

He thought that the procedure in the current code system relating to unscheduled occupational situations was rarely followed and that some simplification was admissible without seriously lowering the precision with which desirable or optimum values of illumination could be assigned to particular tasks by any currently known method, or the precision with which, in fact, they need to be assigned. The simplification consisted in eliminating the need for measuring the contrast presented by task-objects, thus leaving only the apparent size of detail and the highest reflection factor in the contrast to be

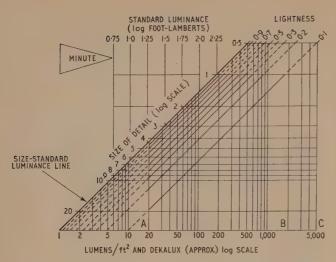


Fig. 3.—Proposed relation between size and luminance; also between size and illumination required for standard luminance according to lightness. "A" indicates a commendable general level of illumination for amenity in work spaces; "B" indicates the probable effective upper limit for specific visual tasks; "C" indicates the absolute upper limit proposed

found. Inherent task contrast was certainly a factor which affected task performability but, since it was not compensatable in this respect by any reasonable and systematic adjustment of illumination, it could be taken into account sufficiently well by suitably defining the performance criterion of the specification system.

He suggested that the criterion should still not be defined as a single level of relative visual performance but as a "zonal level" extending from about 90 to 100 per cent. Then from the available experimental data, a level of luminance for each size could be found which was consistent with performance to the lower limit of the criterion when the task contrast was poor and with performance exceeding this lower limit when the contrast was good. Thus, the standard luminance was dependent only on the lightness of the task-object or material. For the purpose of the method proposed, only one reflection

factor need be measured—the highest involved in the critical detail—since the necessary values of standard luminance could be specified on this basis. A lower limit of 0.1 was suggested for the reflection factor to be used in deriving illumination values from the standard luminance.

This criterion, despite its apparent latitude, was, Mr. Weston maintained, somewhat more exacting than the less explicit criterion underlying the recommendations of the current I.E.S. Code and so, if his proposals commended themselves, a moderate general increase in recommended values of illumination would be consistent with them.

It was evident, Mr. Weston pointed out, that illumination levels found by the simplified method he had proposed properly related only to the critical visual part of any practical task. If this was of brief duration and of comparatively infrequent occurrence it would not be unreasonable to discount the computed illumination if this was high; a somewhat lower value would have a negligibly small effect on the overall task performance and on the well-being of the worker. On the other hand, when there were features of the task which made it visually more difficult than the system under consideration allowed for, e.g. if the task-objects were in motion, then the computed illumination might be increased to some extent. Any general rule governing the amount of such increase or decrease must be rather arbitrary. The computed illumination was not necessarily what would be recommended finally in particular cases, but it was the basic value. No specification system could be devised which would be omnicompetent. In the words of J. S. Mill "No one needs flatter himself that he can lay down propositions sufficiently specific to be available for practice, which he may afterwards apply mechanically without any exercise of thought."

Mr. Weston also pointed out that more generous general lighting than the 6 l/ft² minimum at present prescribed for factories would not only increase satisfaction but would also provide suitable lighting for many visual tasks. He suggested that a level of 20 l/ft² might well be recommended as good practice for amenity lighting.

#### The Use of Plastics

PLASTICS technology at the present time is based upon the development of new chemical combinations of the elements to give new types of molecules, and on the modification of machinery and equipment developed primarily by the rubber and metals division. Dr. C. L. Child, B.Sc., A.P.I. (Plastics Division, I.C.I.), divided his paper "Plastics, Yesterday, Today and Tomorrow" into three sections dealing respectively with developments in materials, in processes and in the uses of plastics in the lighting industry.

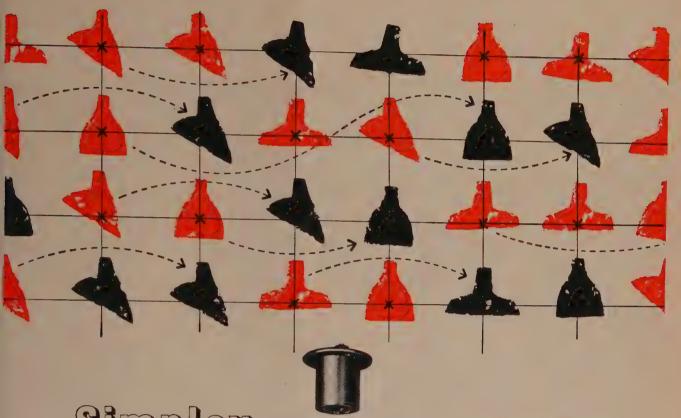
Developments in materials included new chemical formulations, and he referred to polycarbonates, polyformaldehyde, polyesters, polyethers, polyurethanes, silicones and inorganic polymers. In addition, there had been developments in controlling the physical structure of the molecules, and in the last two or three years attention had been focused on the spatial arrangement of polymer molecules. New methods of polymerisation

had enabled the chemist to control chain branching. Attention had also been increasingly devoted to the physical forms in which the polymers were offered to the fabricators.

Limitations of plastics—principally their low stiffness and the sensitivity of their properties to temperature variations—had in some instances been overcome by combining plastics with each other in various ways and also by combining them with other materials such as metals. Dr. Child referred to the uses of high-energy radiation in manufacture and in the modification of the properties of plastics articles. He suggested that the extruder could now do pretty well anything that any other plastics machine could do—except shape thermoplastic rigid sheets.

Though lighting engineers had not shown great understanding in the past of plastics materials, they no longer treated plastics as if they were metal or glass, and they

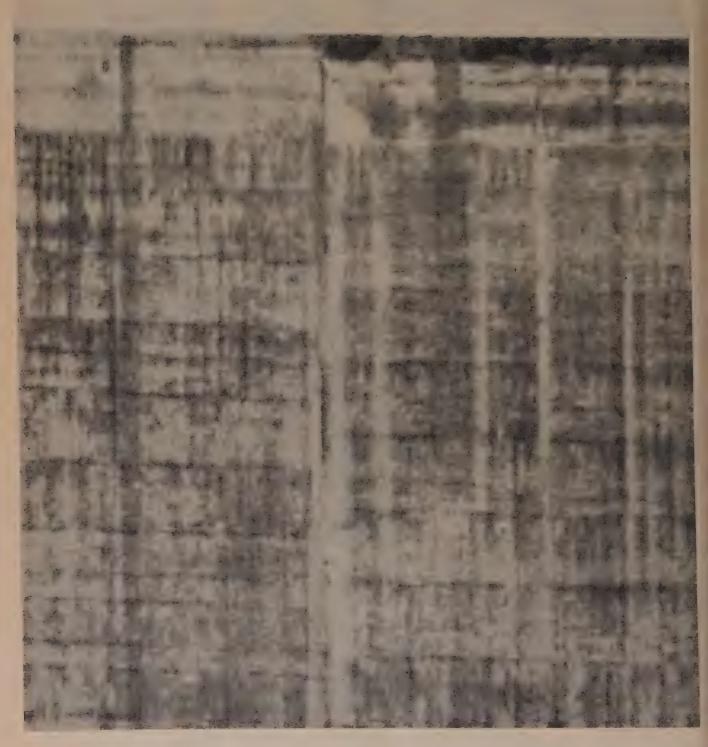
# For your lighting schemes



Simplex discon means plug-in adaptability

Adequate lighting is a priority consideration for peak production, and it is essential that lighting systems should be as flexible as layout changes demand. Liberal planning with Simplex Discon will ensure this flexibility and avoid costly installations later. The Discon is simple to install, simple to remove. By slackening a locknut, the entire assembly—reflector, lampholder and lamp can be released, leaving the wiring intact.

The Simplex Discon is made, for a lifetime of heavy service in extra strong, corrosive-resistant aluminium alloy and has silver plated plug contacts suitable for 15 amps. It is electrically finger safe, too, with colour coded connections. For full details of the Discon, please write to Simplex Electric Company Limited, Lighting Dept., Blythe Bridge, near Stoke-on-Trent, Staffordshire.

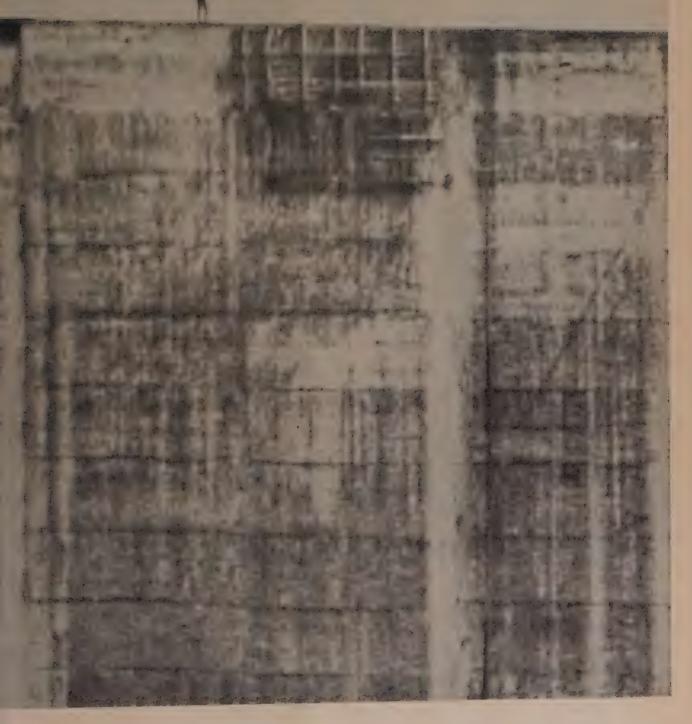


MUSCLE. Mathematics. Money. And horse-power. Horse-power above all. The man-horse combination held the Zambesi floods and built the dam at Kariba.

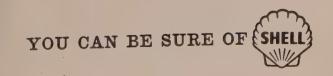
What were the men called? They had no one name. They came from Leghorn and York, from Pisa and Bulawayo, from the Cape, from

Nyasaland and from Kariba itself. The horsepower from Italy, Britain, Africa, America. Men and machines worked in temperatures of 110°F, alternately swallowed dust fine as talcum powder, or sweated in Turkish bath humidity. Lions and elephants looked in from time to time.

# What got him on top of the Zambesi?



Others cared for the men. We fed and projected the horse-power with fuels and lubricants. We were at Kariba in the first days of doubt, when the first machines scratched the gorge. We are still there today when the dam rears complete, and the Zambesi held behind it sprawls from horizon to horizon.





Specialists in the Design and Construction of Motors to Customers' Particular Requirements

#### LANCASHIRE DYNAMO & CRYPTO LTD

TRAFFORD PARK, MANCHESTER 17 . ACTON LANE, WILLESDEN, LONDON, N.W.10

London & Export Office: ST. STEPHEN'S HOUSE, VICTORIA EMBANKMENT, WESTMINSTER, LONDON, S.W.I



The Symbol of Power and Service for over 60 years



The president (Mr. H. G. Campbell) introducing the Mayor of Harrogate, on his right, who opened the conference

had come to recognise that plastics were to be used where—and only where—they could make an effective technical and economic contribution by doing a job better or cheaper than it had been done before.

Though it had been too widely used in the past, ease of cementation remained a valuable property of acrylic sheet, and found spectacular application in illuminated signs. Many components previously shaped from acrylic sheet were now being injection moulded and extruded, and this had the advantage that it could be done with a fine powder-like acrylic polymer. Extrusion techniques had also given a new lease of life to cellulose acetate.

Two new materials of greater stiffness and higher

softening points most likely to affect the practice of lighting engineers within the next few years were polypropylene and the polycarbonates. Polypropylene was a lightly translucent material, which could be pigmented to give a range of opals; it was also very light and tough. Polycarbonates could be produced as transparent materials of considerable strength. However, much had still to be learnt about their properties and limitations. In conclusion, Dr. Child said that one of the most important developments in plastics was the growth of plastics films—cellulosic, polythene, vinyl, polyester, polypropylene and others—and he asked why lighting engineers had as yet made no use of them.

#### DISCUSSIONS ON PAPERS

THE reduction in the sizes of tungsten lamps and the relation between efficiency and colour rendering in fluorescent tubes were the main points taken up in the discussion on Mr. Jenkins' paper. Dr. J. W. Strange (Thorn) said he thought the I.E.S. was the right body to feel misgivings at the reduction in lamp sizes. Such lamps could cause serious overheating when used in fittings originally designed for low wattages. However, Mr. F. Widnall (A.E.I.) said they could not resist the trend towards miniaturisation. The problem of overheating was exaggerated and was not new. An E.R.A. report in 1922 had stated that 80 per cent of the fittings then used overheated; most of these fittings had, however, continued in use. On the other hand, Mr. B. C. Ossitt (Seeboard) said that tests by his Board had revealed few cables that could withstand the heat produced by small tungsten lamps, and he thought that people would be wise not to use them unless their wiring was modern and adequate.

Dr. Strange said there would be chaos if the trend in America towards fluorescent tubes with low-voltage cathodes spread to this country, because if they were used in switchless-start fittings the filament transformer would burn out. Dr. Strange doubted whether the improvement in efficiency of about 10 per cent which Mr. Jenkins claimed as due to the use of classified phosphors was entirely attributable to this cause. He thought that improvement at an earlier stage of the preparation of the material was also significant. Dr. Strange referred also

to the widening gap between high-efficiency and high-fidelity tubes.

Mr. H. R. Ruff (A.E.I.) said he thought that people were still willing to trade light for colour. On the other hand, Dr. H. H. Ballin (Atlas) reported that they had found that in shops a substantial reduction in light was acceptable where the colour rendering was improved. He felt that in this country too much stress was put on output and efficiency at the expense of colour. There was nothing sacrosanct about tungsten and they should give up trying to imitate it. He thought that the introduction of fancy shaped bulbs, which did away with the need for fittings, was a wrong approach. Tungsten lamps were too bright to use as a bare source, and the problems of storing and distributing a large variety of types would lead to chaos.

Replying, Mr. Jenkins said he agreed that caution was needed with the small lamps, but it was, in fact, now being exercised for the first time. Many of the dangers were due to the design of fittings and not to the size of the lamps. He agreed also that if phosphors could be produced under ideal conditions there would be no need for classification, but the 10 per cent rise in efficiency had in this instance been produced by the classification process. He stressed that cold lighting was not wanted in many circumstances, and he welcomed the emphasis now being put on colour rendering rather than efficiency.

In opening the discussion on Mr. Weston's paper,

Mr. J. S. M. McCulloch (Merz & McLellan) said a panel of the I.E.S. Technical Committee had approved Mr. Weston's proposals as a basis for illumination recommendations in the new I.E.S. Code, subject to relating the experimental data to practical features associated with the tasks. The final recommendation would be based on experimental data tempered with common sense. The higher standards of productivity, amenity and safety now expected, allied to the decreasing cost of light production, justified the adoption of higher standards of visual performance, and had led the panel to increase the illumination level for many tasks.

Mr. J. M. Waldram (G.E.C.) effectively showed by means of slides how the task analysis of even the most simple job could become complicated and misleading. This point was taken up by Mr. W. Robinson (E.D.A.) who suggested that it was an important part of the new code to draw attention to the many other aspects of illumination apart from task analysis. Mr. R. L. C. Tate (Harris & Sheldon) said that an increased value of illumination should not be regarded as the sole criterion; other factors—colour, direction of light, etc.—were also important.

Dr. W. E. Harper (I.C.I.) said the revised code was designed for the practitioner not the scientist. In making the recommendations they had to bear in mind what was practicable in present circumstances. They had to carry the user with them. He thought that this would be the last edition of this type of code. They had passed beyond the objective study of illumination levels. The need now was for a thorough-going study of subjective requirements to be promoted. Mr. J. F. Pickup (Borough Polytechnic) thought that the code would have more impact if the information was better presented.

#### Fountains Abbey Floodlighting

On Monday evening the delegates visited Fountains Abbey where a special display of floodlighting had been arranged. Except for the main tower, which is illuminated by a bank of 20 high-intensity 1,500 W tungsten flood-



Two of the authors, Mr. H. G. Jenkins and Mr. H. C. Weston



Mr. C. C. Smith, Mrs. Campbell, Mr. Campbell and Dr. W. E. Harber

lights mounted on a 6oft high steel scaffolding, the effects are obtained almost entirely with coloured fluorescent tubes, using techniques originally developed for Son et Lumère. Apart from the obvious economy in operation, fluorescent tubes give a more even colour distribution. A ruin offers great possibilities as a subject for floodlighting because the spectator can wander through the building and see several illuminated planes at once. At Fountains Abbey further enchantment has been achieved by floodlighting surrounding natural features.

#### **Cantor Lectures**

DR. J. M. KAY, Professor of Nuclear Power, Imperial College of Science and Technology, delivered the first 1960 Cantor Lecture at the Royal Society of Arts on 9th May. His subject was "The Generation of Power" and he surveyed the methods of producing electricity from coal, oil and water power. In dealing with hydro-electric power he briefly described the various types of turbine employed and their application. Similarly, he described the operation of thermal turbo-generators, with particular reference to steam pressures and temperatures, and to the growth in size of these sets.

Mr. F. H. S. Brown, deputy chairman of the Central Electricity Generating Board, delivered the second lecture last Monday. His theme was "The Power System" and one of his main points was that electricity production would mainly depend upon coal for some time. Eventually nuclear power would be essential to supplement coal supplies as they were overtaken by demand.

At present nuclear power stations were "marginally uneconomic" but nuclear knowledge and techniques would have to be available for the future. There was a reasonable

prospect that by about 1970 a nuclear station would produce cheaper electricity than a coal-fired station.

On the subject of "amenities," Mr. Brown said that the expansion of the electricity supply industry would necessitate more power stations and transmission lines. The only way to prevent this was to prohibit further growth, but that was impossible if we were to maintain and improve living standards and industrial progress.

The third lecture, "The Retail Distribution of Electricity," is to be given by Mr. C. Robertson King, C.B.E., chairman of the Electricity Council, on Monday next.

#### BATTERY SYMPOSIUM

A SYMPOSIUM sponsored by the Inter-Departmental Committee on Batteries is being held at the Pavilion, Bournemouth, from 18th to 20th October. Twenty-five papers to be presented include aspects of research, development and production of batteries of all types. Further information can be obtained from Mr. F. C. Wells, Ministry of Aviation, S.R.D.E., Christchurch, Hants.

### PERSONAL AND SOCIAL

### News of Men and Women of the Industry

Mr. P. R. Howard, Ph.D., B.Sc.(Eng.), A.M.I.E.E., has been appointed head of the high voltage laboratories at the Central Electricity Research Laboratories, Leatherhead. He will be assisted by Mr. D. F. Oakeshott, B.Sc., A.Inst.P., M.I.E.E., who has been appointed deputy head.

Dr. Howard entered Government service in 1942 when he became a scientific officer in charge of the Electrical and Instrumentation Section of the Airborne Forces Experimental Establishment. Following the reconstruction of the Scientific Civil Service in 1947 he joined the staff of the high voltage laboratory at the National Physical Laboratory and subsequently became a principal scientific officer. He left in 1958 to join the Applications Branch of the Research and Development Department of the Central Electricity Generating Board as head of the transmission systems section.



TA

Dr. P. R. Howard

Mr. D. F. Oakeshott

Mr. Oakeshott joined the Electricity Division of the National Physical Laboratory in 1936 after a year as a student-employee with the Research Association of British Rubber Manufacturers. From 1941 he worked in the high voltage laboratory of the N.P.L. He left to become senior scientific officer in charge of surge British Insulated research with Callender's Cables, Ltd., in 1946. He joined the staff of the then British Electricity Authority in 1948 as a senior assistant engineer at the research laboratories, Leatherhead, and in 1955 he was appointed head of the transmission and distribution section. He relinquishes this post to take up his new duties.

Mr. H. J. H. Nethersole, general manager of the English Electric Co.'s Traction Department, has been appointed a director of two member companies of the English Electric group—Vulcan Foundry, Ltd., and

Robert Stephenson & Hawthorns, Ltd. Mr. Nethersole, who was formerly managing director of the English Electric Co. of South Africa (Pty.), Ltd., became general manager of traction at the beginning of this year and remains a member of the board of the South African company.

Mr. F. B. Manning has been appointed secretarial officer to the Chilterns Sub-

Area of the Eastern Electricity Board and he will in future work from Prebend Street at The Bedford. vacancy arises from the retirement i of Mr. F. G. Page. Mr. Manning has been associated



Mr. F. B. Manning

with electricity supply for most of his working life, first at Peterborough and then at Luton. He joined the Eastern Electricity Board in 1949.

Mr. N. E. Wilkinson has recently taken up an appointment with Nettle Accessories, Ltd., to be responsible for the further development of the industrial division. He served an apprenticeship with Manchester Corporation Electricity Department before service in the last war in the R.A.F. On demobilisation he joined Frigidaire, Ltd., for two years, and then took up an appointment with Thorn Electrical Industries, Ltd. (Atlas Lighting Division).

Mr. Ernest Long, a member of the Central Electricity Generating Board, is speaking at the annual conference of the Chartered Institute of Secretaries, of which he is president, at Norwich (19th-21st May). His subject is "Electricity: Twelve Years of Public Ownership."

A total of 165 employees of Jackson Industries, Ltd., Luton, one of the electrical companies in the Radiation Group, were the guests of the directors of Radiation, Ltd., the parent company, at a dinner at the Halfway House Hotel, Dunstable, on 12th May. The dinner was the last of a series of five (Liverpool, Leeds, London and Birmingham were other venues), at which, in all, nearly 1,000 employees of the Radiation Group with over

twenty-five years' service were presented with suitably inscribed chiming clocks. In addition, 253 of the Group's employees (forty-six from the Birmingham companies) have served for forty years or more, entitling them to receive gifts of their own choice, up to a value of £50 each. The presentations were made by Mr. W. D. King, chairman of Radiation, Ltd.

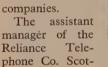
Sir James Doak, who has been associated with Fenner's Indian enterprises for a number of years, has joined the board of J. H. Fenner & Co. (Holdings), Ltd.

Mr. J. E. Lord, first assistant district commercial engineer of the Rochdale District of the North Western Electricity Board, has been appointed district engineer in that District, and Mr. W. B. Elliott, second assistant engineer in the No. 1 Sub-Area Headquarters Engineering Section, has been appointed district engineer, Central District, in the same Sub-Area.

Mr. G. J. Gaunt, sales manager of the Reliance Telephone Co., Ltd., has been appointed a director. He has also joined the board of Telephone Supplies, Ltd., an associate company. Both companies are subsidiaries of the General Electric Co., Ltd.

Mr. W. T. Ashton, A.M.I.E.E., has

retired as a director of the Reliance Telephone Co. and Telephone Supplies after more than forty years' service with the companies.





Mr. G. J. Gaunt





Mr. W. T. Ashton

Mr. R. V. Doyle

tish area, Mr. R. V. Doyle, has been appointed manager of the area in

succession to Mr. H. J. McCusker, who has retired.

At a directors' meeting of Heatrae, Ltd., held at Norwich on 10th May, Mr. A. H. Freeman, A.M.I.Mech.E., A.M.I.C.E., was elected chairman and managing director. Mr. Freeman has served for the last 14 years as deputy to the late Mr. C. H. Smith, who was a founder of the business, and at the time of his death was chairman and managing director.

Mr. J. R. Davies has been appointed sales manager of Crompton Parkinson (Stud Welding), Ltd., in succession to Mr. R. W. Taylor.

At a recent board meeting of Keith Blackman, Ltd., Mr. C. J. Atkins (sales director) and Mr. F. W. Goodge (contracts director) were appointed joint assistant managing directors. Consequent upon this, the following new appointments become effective from 1st June:—Mr. F. W. Brown, commercial manager; Mr. E. A. Manning, "V" Department manager; Mr. R. F. Williamson, contracts manager; and Mr. P. C. Burden, chief draughtsman (contracts).

The annual conversazione of the Convocation of the University of London was held last Saturday at the Senate House. Following the reception by the chairman of the Convocation, Dr. P. Dunsheath, there was a varied programme of entertainment by British and overseas students.

Mr. C. L. Lipman, M.I.E.E., chief technical engineer of Nalder Bros. & Thompson, Ltd., retired on 30th April after forty-three years' service with the company. He came to this country in 1917 from Liège University and continued his education at King's College and London University, becoming chief technical engineer at

Mr. E. W. Semmens (left) making a presentation to Mr. C. L. Lipman on his retirement from Nalder Bros. & Thompson



Nalders in 1918. He has served on many B.E.A.M.A. and B.S.I. technical committees and in 1944 was awarded the I.E.E. Mather Premium. During his service with Nalders Mr. Lipman developed numerous patents. He recently received a presentation from the company in the form of a television and v.h.f. receiver from the managing director, Mr. E. W. Semmens, who also presented him with a gold wristwatch from his friends and colleagues.

Mr. S. W. Eckett, B.Sc.(Eng.), A.M.I.E.E., has been appointed chief engineer of Nalder Bros. & Thomp-



Mr. S. W. Eckett

son, Ltd. Mr. Eckett studied engineering at West Ham College of Technology and his past experience includes a number of years in the Chief Mechanical Electrical and Engineer's Department British Railways

(E. and N.E. Regions). He joined Nalder Bros. & Thompson, Ltd., in 1951 as research and development engineer, since when he has represented the company on both B.S.I. and B.E.A.M.A. technical committees. He has been responsible for a number of developments, including monitored earth leakage devices and electrostatic voltmeters.

Following the annual general meeting of A. Reyrolle & Co., Ltd., on 12th May, Mr. H. H. Mullens, chairman, made presentations of gold wristwatches to twenty-four employees who have completed forty years' service and are still employed by the company.

Mr. G. L. Greaves, A.C.I.S., M.B.I.M., has been appointed assistant secretary (personnel) of the Yorkshire Electricity Board in succession to Mr. H. E. A. Donnelly, M.C., T.D., A.M.B.I.M. Mr. Greaves has been in the electricity supply industry for 27 years and is at present establishments officer with the North West, Merseyside and North Wales Region of the C.E.G.B.

Mr. H. Doust, A.M.I.E.E., is retiring from the Yorkshire Electricity Board on 6th June after 46 years in the industry. He commenced his career with the Grimsby Corporation in 1914 and in 1931 he became engineer and manager of the Louth Corporation Electricity Department. In 1948 he was appointed manager of the Y.E.B. Gainsborough District, from which position he now retires. He will be

succeeded by Mr. E. H. Jubb, A.M.I.E.E., who is at present senior assistant engineer (commercial) in the Grimsby Sub-Area.

Mr. C. Young, A.M.I.E.E., A.M.Inst.F., has been appointed by the Isle of Man Electricity Board as power station superintendent at Peel in succession to Mr. F. J. Riches, who retired at the end of April.

Mr. S. R. Gee, regional cable sales manager of the North Western Region, A.E.I. Cable Division, completed forty years' service recently and on 27th April Mr. H. D. Parsons, divisional sales manager, presented him with a gold watch in recognition of his achievement.

Mr. N. Fenwick has been appointed sales promotion manager of W. G. Pye & Co., Ltd. He has been in the home sales department for the past four years.

Following the appointment of Mr. H. W. Povey, O.B.E., previously chief accountant, as a full-time member of the Uganda Electricity Board, Mr. W. W. Duff, deputy chief accountant, has been appointed accountant and registrar, and Mr. H. S. Smith, senior cost accountant, becomes deputy accountant and registrar. Mr. Povey will continue to be in charge of the Board's overall finances.

Mr. A. G. Brown has been appointed a lighting engineer with the southeast region of Philips Electrical, Ltd. Mr. Brown saw previous service with Philips as a sales engineer in the south-east region from 1957 to 1958. Since that time he has held an appointment in Nigeria and has recently returned from that country.

Mr. J. E. Price, A.M.I.E.E., of Lancashire Dynamo & Crypto, Ltd., and a director of Malcolm & Allan (London), Ltd. (both are companies in the Metal Industries Group), was elected a vice-president of the Association of Lancastrians in London at the annual general meeting. He had previously held the office of chairman for thirteen years.

Mrs. A. L. Hayes, area organiser in the Midlands and East Midlands for the Electrical Association for Women for twenty-five years, is retiring at the end of May. Mrs. J. Woodall succeeds her as area organiser in the Midlands Area and Mrs. M. E. Bailey is appointed area organiser in the East Midlands Area.

The annual cricket match between the Electrical Trades' Commercial Travellers' Association and the Royal Commercial Travellers' School will be held on 11th June at Hatch End, Pinner, Middlesex. Players and visitors will be welcome. The open day, or association day, of the Royal Commercial Travellers' School will be held on 18th June. Those wishing to attend should contact the charity steward of E.T.C.T.A., Mr. W. Candelatt, 76, Rugby Avenue, Wembley, Middx.

At the annual dinner of the Electrical Wholesalers' Federation on 24th March Mr. F. J. Blackwell announced that the Federation had that day joined the European Union of Electrical Wholesalers. A delegation from the Federation attended the general assembly of the European Union held at Baden-Baden on 12th and 13th May. The members of the British delegation were Messrs. G. Conradi (president), J. H. Hirst, H. Riley, B. Reynolds, N. S. Sellers, N. G. Smith and P. B. Etheridge (director).

At the May meeting of the Council of the London Chamber of Commerce Mr. A. L. Stock (chairman, Morgan Crucible Co., Ltd.) was re-elected chairman.

The golf day of the Electrical Industries Club will be held on 30th June at Highgate Golf Club. An open greensome competition will be held in the morning and the Stableford competition for the Benn Cup in the afternoon.

The North Western Branch of the Electrical Trades Commercial Travellers' Association held a general meeting on 9th May, at the Sefton Hotel, Manchester. Mr. F. Foulkes (chairman) opened the meeting and Mr. R. H. Corlett (national chairman) was present and reported on his visits to various functions. There was some discussion about the facilities offered by the employment section and it was urged that employers and representatives should make more use of this service. A collection for charity raised £2 178 6d. A bowling match will be held on the evening of 17th June at the Rope and Anchor Hotel, Dunham Massey, Altrincham, and ladies are invited.

#### **OBITUARY**

Mr. P. J. Fell, A.M.I.E.E., East Midlands area manager of A. Reyrolle & Co., Ltd., died on 8th May at the age of forty-four. He had been with the company since 1937, but served in the Royal Navy from 1940 to 1946.

Mr. C. C. Cockbain.—The death occurred on 8th May at St. Helier's Hospital, Sutton, of Mr. Charles

Claude Cockbain, at the age of sixtyfive. In his capacity as sales manager and engineer with Bullers, Ltd., whom he joined in 1912, he was closely connected with the early development of high voltage overhead transmission.

#### WILLS

Col. Sir William J. Kent, C.B.E., late chairman of Taylor Tunnicliff & Co., Ltd., and a director of Taylor Tunnicliff (Electrical Industries), Ltd., and other companies, who died on 5th March last, left £493,695 gross (£477,900 net).

Mr. E. R. Crammond, late chairman of British Industrial Plastics, Ltd., and deputy chairman of Hopkinsons, Ltd., who died on 25th January last, left £79,767 gross (£72,161 net).

Mr. J. W. Record, M.I.E.E., founder of the Record Electrical Co., Ltd., who died on 9th October last, left £52,673 gross (£51,615 net).

Mr. F. C. Fenton, O.B.E., former chief commercial officer of the London Electricity Board, who died on 26th February last, left £31,056 gross (£30,843 net).

Mr. A. Southern, chairman and managing director of Southern & Redfern, Ltd., who died on 12th November last, left £41,770 gross (£40,600 net).

Mr. P. R. Coursey, B.Sc., M.I.E.E., F.Inst.P., consulting electrical engineer, former technical director of the Dubilier Condenser Co., Acton, who died on 3rd January last, left £26,869 gross (£25,137 net).

Mr. A. H. W. Marshall, M.I.E.E., formerly of the Cleveland and Durham Electric Power Co., and the Newcastle-upon-Tyne Electric Supply Go., who died on 12th September last, left £24,322 gross (£24,162 net).

Mr. G. Carter, managing director of Ada (Halifax), Ltd., who died on 15th July last, left £181,534 gross (£128,677 net).

Mr. F. Newton, a director, technical consultant and one of the founders of Newton Brothers (Derby), Ltd., who died on 1st November last, left £126,151 gross (£120,302 net).

Mr. K. R. Hopkirk, former director and chief mechanical engineer of the British Thomson-Houston Co., Ltd., who died on 24th April last, left £5,033 gross (£4,536 net).

Mr. F. G. Creed, inventor of the Creed telegraphy system, who died on 11th December, 1957, left estate in Great Britain valued at £1,496 gross (£1,117 net).

#### **Prices of Materials**

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

#### **Automatic Control Techniques**

ON Monday last a preview was given of a film, "Invitation to Prosperity," illustrating the way in which automatic control equipment can help industry towards greater and more profitable production. The applications shown are in everyday use in almost every branch of industry, the equipment ranging from simple photoelectric switching units to complete automatic control installations. The film, which has just been made for Lancashire Dynamo Electronic Products, Ltd., by Technical & Scientific Films, Ltd., in association with the Film Producers' Guild, conveys to the potential user a broad picture of some of the many ways in which automatic control equipment based on electronic and allied techniques can be applied to practical problems. Apart from industrial uses of automatic control, reference is also made to applications in research and development and to uses in medicine. The film will be shown throughout the forthcoming Instruments, Electronics and Automation Exhibition at Olympia on the stand of Lancashire Dynamo Electronic Products, Ltd. Copies of the film will be available for general distribution from all leading film libraries by the autumn.

#### Training of Technicians

IN his address at the annual conference of the Association of Supervising Electrical Engineers at Scarborough last week, the chairman, Mr. C. G. Aldridge, referred to facilities for the training of technicians. He said that only the large manufacturing units were able to fulfil all the requirements from their own resources. In the past the smaller units of industry had had to resort to schemes of co-operative and group apprenticeship training. The Association had sought an alternative method and in collaboration with the Crawley College of Further Education, a "pilot" full-time college-based course of basic electrical technician training was being started in September next. This limited scheme would make available to employers, for a nominal registration fee, the premises, equipment and instruction required for the training of potential electrical technicians during the first 40 weeks of apprenticeship. Following the course the employers would be able to provide for specialist objective training of apprentices within their own establishments. This method of training would overcome the objections to the co-operative and group schemes.

#### Financial Section

# STOCKS and SHARES

HAVING been in a fairly steep decline for a period of four months, industrial share prices seemed to reach the level at which investors were prepared to take a fresh interest. Some continue to hark back upon the figures of up to 30 per cent by which prices depreciated during the three major "bear" markets since the war, but for others the yields of 4 to 5 per cent offered freely now on high-grade industrials have evidently been accepted as a fair enough basis in relation to the economic position and trading prospects. Selling dried up, and by the beginning of this week many quotations had responded quite sharply to a still rather tentative revival of demand.

#### **Better Prices**

distinctly firmer tendency appeared among the shares of the major electrical groups. A.E.I. recovered 2s to 54s 6d during the week, while English Electric hardened to 39s 6d, G.E.C. to 39s and Crompton Parkinson to 12s 3d. C. A. Parsons picked up 2s 6d to 49s 3d, and there were recoveries of two to three shillings in Babcock & Wilcox, Simon-Carves and Tube Investments. In the domestic equipment section Hoover showed the way, as usual, in rising 3s to 50s, while Morphy-Richards moved up to 21s 3d, nearly their best price of the year. Midland Electric Manufacturing at 58s 9d also achieved that distinction. E.M.I. returned to favour with a 5s rise to 50s and Plessey, at 48s, recovered 3s 9d of their earlier falls. On the other tack, Metal Industries were marked down to 62s 6d after news that the company plans to raise about £4 million, by a "rights" issue of new shares, to replace overdrafts granted during the recent acquisition of Lancashire Dynamo.

#### Radiation Dividends

In the full report of the Radiation company there is confirmation of the remarkably successful results of 1959, during which the net taxed profit was virtually trebled, and also some cautionary notes in the chairman's review on the subject of this year's prospects. Signs of a slackening in demand are said, by Mr. Donald King, to have appeared towards the end of last year and to have increased in more recent

months. He expects some recession from the record 1959 results. Dividend policy, he says, is to establish a rate which may be expected to be maintained in reasonable conditions. Hence the decision to declare the distribution for 1959 in the form of a 10 per cent dividend plus a 2 per cent bonus the repetition of which in subsequent years is not to be assumed. Quoted at 38s 9d, the £1 shares show a yield of nearly 6½ per cent on the full payment or 1 per

#### Price Changes in

				Week's		Dividend			1960	
Company or	Board		Nom. Value	Middle price l6th May	Rise or Fall	Pre- vious	Last	Yield %	High- est	Low- est
Gilt-edged Stocks £ s d										
Brit. Elec. 1968/73	***	• • • • • • • • • • • • • • • • • • • •	100	76 <u>1</u>	+1	3	3	3 18 9	791	75½
Brit. Elec. 1974/77	***	***	100	73		3	3	4 2 3	76	72½
Brit. Elec. 1976/79	211	***	100	75½		31	31	4 12 9 4 18 9	79½	75½
Brit. Elec. 1974/79	***	***	100	86		41	41	4 18 9	90½	85½
Overseas Electric Su				pply 20/6		6·8†	<b>7</b> †	11 3 0	20/9	19/3
East African Power	, ***	***	£I	16/-		7½	8	10 0 0	20/3	16/-
Nigerian Elec	***	***	£I	15/6		8	8	10 -6 6	19/9	15/6
Perak Hydro-Elec.	***	***	£I	17/6	+6d	10	5	5 14 3	17/9	15/3
At 1. 11.10	ares									
Aberdare Holdings Aerialite	***	***	5/- 1/-	16/- 7/9	+9d +3d	17 <u>1</u> 54	17½ 54	5 9 6 6 19 3	19/-	15/3
Allen, W. H		***	£I	52/6	<b>-1/3</b>	11	12	6 19 3	9/6 60/-	7/6 52/6
Allied Insulators		***	5/-	20/-	.,,		20	5 0 0	23/3	20/-
Anglo-Portuguese Tel		***	£I	28/3		9 .	9	6 7 6	28/6	26/-
Aron Elec. Ord	***	1,000	£1	62/-		15	15	4 16 9	62/-	47/-
Assoc. Elec. Ord	***	***	£I	54/6	+2/-	15	15	5 10 0	66/6	50/6
Automatic Tel. & El. Babcock & Wilcox	*** "	***	5/- £I	18/6 38/9	3d	17 13	17	4 12 0	21/9	17/3
Bakelite	***	***	10/-	47/6	+2/6 +1/3	15	171 .	4 13 0 3 13 9	48/9 48/9	33/6
Baldwin, H. J.			2/-	2/6	1 1/3	20			2/6	40/- 2/3
Berry's Electric	***		5/-	33/6	—3d	10	201*	2 19 9	38/-	29/6
Bowthorpe Holdings	***	***	2/- *	8/3	6d	27	181*	4 9 9	11/6	8/3
British Elec. Traction:				40.10						
Def. Ord. "A"  B.I. Callender's	410	***	5/- £1	42/6	+6d	25	35	4 2 3	49/3	42/-
B.I. Callender's 6% Pr	ref.	•••	£I	54/6 20/-	+6d	13½ 6	13 <u>1</u> 6	4 19 0	61/-	50/-
British Thermostat		•••	5/-	21/3		30	35	6 0 0 4 2 3*	21/-	19/9 21/3
Brook Motors		•••	10/-	45/6	-9d	25	25*	4 14 0*	53/6	45/6
Bulgin, A. F	•••	***	1/-	10/-		50	55	3 13 3*	10/3	8/-
Bulpitts	,***	***	5/-	17/6	+6d	15	161	4 12 9	23/3	17/-
Burco Dean Cable & Wireless:	***	***	5/-	13/9	+1/3	16	18	611 0	15/9	12/6
Ord ,	***		5/-	15/3	+3d	10	10*±	3 5 6 1	10/2	1.4/2
4% Loan	***	***	100	96	, 54	4 .	4	4 3 3	18/3 96	14/3 94½
Chloride El, Storage "	'A"		£I	70/-		20	171*	5 0 0	74/-	65/6
Clarke Chapman	***	***	£I	48/9		132	132	5 12 9	63/6	48/9
Cole, E. K , Contactor Switchgear	***	***	5/-	23/-	+1/-	171	20	470	31/9	22/-
Cossor, A. C	•••	***	5/- 5/-	16/6 7/3		I4 Nil	14	4 4 9	17/9	15/9
Crabtree		***	10/-	23/6	-6d	20	5 22 <u>1</u> 1	3 9 0 4 15 9*	10/-	7/3
Crompton Parkinson	***	***	5/-	12/3	+6d	12	14	4 11 6*	28/3 15/-	24/- 11/9
Davis & Timmins	***	٠	5/-	27/6	-9d	20	25	411 0	28/9	21/-
De La Rue	***	***	10/-	66/3	+4/3	17½	20	3 0 3	73/6	62/-
Decca " A " Desoutter	***	***	10/- 5/-	42/-	-6d	50	20*	4 15 3	51/3	42/-
Dewhurst	••• \	***	2/-	42/- 7/6	3d	21§ 20	30 20	3 11 6	42/-	37/6
Dictograph Tel	***		2/-	9/9x.c.	54	20	20	5 6 9 3 I 6	8/6 9/9	7/6
Dimplex	***		5/-	30/-		_	25‡	4 3 3	32/6	9/- 26/9
Dubilier Condenser	***	***	1/-	5/6	—3d	20	25	4 11 0	6/-	5/-
Duport E.M.I	***	***	5/-	22/-		121/2	171	3 19 6	30/3	22/-
E.M.I Electrical Apparatus	***	***	10/- 5/-	50/- 14/9	+5/-	20	14*‡	2 16 0	58/9	45/-
Electrical Components		***	5/-	9/9	+6d -3d	14 <u>}</u> 12 <u>}</u>	14 <u>1</u> 15	4 18 3	15/-	12/9
Elec. Construction	***	•••	£I	37/6		81	9	5 2 6* 4 16 0	13/9	10/-
Elliott-Automation	***/	***	5/-	22/-	+6d		9.3*	2 2 6	43/- 25/-	35/3
Enfield Rolling Mills	***	***	£I	48/-		15	15	6 5 0	56/3	19/9 48/-
English Electric	ive lund	***	£l	39/6	+9d	14	10*	5   3	53/-	38/9
English Electric 3% P Ericsson Tel		***	£1 5/-	12/6		34	32	6 0 0	13/-	12/6
Ever Ready	•••	***	5/-	22/6 · · · · · · · · · · · · · · · · · · ·	+1/-	13† 20	13† .	4 14 3	28/6	22/6
Falk Stadelmann	***		£I	32/-	/-	10	27‡ 10	3 8 9* 6 5 0	27/3	23/-
The above qu					-			6 5 0	35/9	32/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

\* After scrip issue.

† Free of income tax.

‡ Dividend indicated.

cent less if the bonus element is excluded.

#### Dictograph Issue

The 2s shares of Dictograph Telephones are now quoted "ex" a one-

for-three scrip distribution and at 9s 9d rank among the select few industrials standing near their highest value of the year. The interim dividend now declared on account of the year ending next August applies to both old

#### Electrical Investments

			Week's Middle Rise		Dividend		1960		
Company or Bo	oard	Nom. Value	price l6th May	or	Pre- vious	Last	Yield %	High- est	Low- est
E	Electrica	al Shares—c	ontinued				£sd		
G.E.C	***	£1	39/-	+9d ·	10	10	5 2 6	47/6	37/-
G.E.C. 6½% Pref	***	an £1	21/-	1	61	61	6 3 9	22/3	21/6
General Cables	***	5/-	6/-		15	Nil	******	10/-	6/-
Goblin (B.V.C.) Greenwood & Batley	***	5/-	9/9 125/-	<b>−3</b> d	7½ 20	121	6 8 3	13/9	9/9
	***	6.1	123/-		20	20	3 4 0	125/-	120/-
Hackbridge Holdings	***	5/-	15/3	+-3d	20	20	6 11 3	17/3	15/-
Hackbridge & Hewittic Head Wrightson	•••	5/-	14/3 21/3	1/6	20 20	20 141*	5 5 3* 3 5 9	15/-	13/-
Heatrae	•••	2/-	11/6	1/0	20	20	3 9 6	31/6 11/9	21/3 8/9
Holophane	***	5/-	18/-	6d	22½	26	7 4 6	20/6	17/6
Hoover	***	5/-	50/-	+3/-	60	90	4 10 0*	55/-	45/-
I.C.I	***	£1	58/6	+3/-	8	112	3 17 0	62/9	55/6
Intl. Combustion	***	5/-	28/6	+1/-	30 .	30	-5 5 3	46/9	26/6
Intl. Computers & T.	*** .	£1	64/6	+3/-		10	3 2 0	78/6	61/6
Johnson & Phillips	***	£1	21/-	+6d	5	5	4 15 3	24/-	20/-
Laurence Scott	***	5/-	18/6		15	15*	4 1 0	25/3	18/-
Lister, R. A	***	£1	52/6x.r.		121	14	5 6 9	62/-	52/6
Lucas, J	***	£1	65/9		10	121	3 16 0	74/6	65/9
Marconi Marine	***	£1	45/-	- I/3	10	10	4 9 0	46/3	42/6
Marryat & Scott	***	2/-	15/- 48/9	1/3	37 <u>₹</u> 10 <u>%</u>	22½*	2 19 0 4 10 3	16/9 59/-	14/3
Mather & Platt Metal Industries	600	£1	· 62/6	-3/-	14	15‡	4 16 0	76/3	48/9 -62/6
Midland Elec. Mfg.	***	£1	58/9	+1/3	10	12	4 2 0	58/9	53/6
Morphy-Richards	***	4/-	. 21/3	+ 1/-	20	25	2 7 0*	22/-	16/3
Murex	•••	£1	65/-	+6d	171	15	4 12 3	77/-	62/6
Newman Ind	•••	2/-	5/3		10	12½	4 15 3	5/3	4/-
Oldham & Son	***	1/-	3/3	+6d	171	17½	5 7 9	3/3	2/9
Parsons, C. A	***	£!	49/3	+2/6	8 <del>}</del> 13∙3	9≹ 16	3 15 9 1 15 9	59/- 180/-	46/- 137/-
Philips' Lamps	***	Fl.10	180/- 48/-	+2/6 +3/9	20	14*1	2 18 3	54/6	44/3
Plessey	•••	5/-	16/9	+9d	121	121*1	3 14 9	19/-	16/-
Pyrotenax	***	5/-	55/-	+1/3	-	34	. 3 2 0	55/~	44/3
		£1	38/9	+1/3	. 6	12	6 3 9	44/6	34/6
Radiation Reliance Clifton	***	5/-	22/-	, -,-	15	15	3 8 3	28/-	22/-
Reyrolle	***	£1	77/6		171	17支	4 10 3	104/6	77/6
Rheostatic	vin a	4/-	21/-	-6d	20 81/3	25‡ 8½	4 15 3 7 11 6	22/ 14/9	16/6 10/9
Richardsons Westgarth	***	10/-	11/-	+3d	03	03	7 11 0	1-1/2	10,7
Simon-Carves	•••	5/-	48/9	+2/-	25	35	3 11 9	54/-	36/-
Smith (England), S.		4/-	16/3	4.17	12½ Nil	17½ 5	4 6 3 6 9 0	20/- 15/6	16/- 13/-
Southern Areas	•••	£1	15/6 16/-	+1/-	15	20	6 5 0	20/3	16/-
Strand Elec Sturtevant	***	5/-	15/-		15†	15†	8 3 3	24/3	15/-
Sun Elec ···		5/-	15/3		25	15*	4 18 3	16/3	15/-
Switchgear & Cowans		5/-	16/-		15 .	171	5 9 6	18/9	16/-
T.C.C	h = =	10/-	72/6		25	35	4 16 6	72/6	55/9
Telephone Mfg	***	5/-	6/3	1.470	10	10	8 0 0 3 15 0	7/3 · 19/9	5/- 17/-
Telephone Rentals	***	5/-	20/- 18/3	+1/3 +3d	12 <u>1</u> 25	15* 25	6 17 0	25/9	17/3
Thompson (John)	***	5/-	47/6	+6d	17½	20	2 2 0	55/6	44/3
Thorn Elec Thorneycroft	***	5/-	23/-	-9d	71/2	6	5 4 3	31/-	23/-
Tube Investments		£1	77/6	+3/6	20	13‡	3 7 0	95/6	65/3
Vactric	***	5/-	33/-	+1/-	25	37½	5 11 0,	43/9	32/-
Walsall Conduits	•••	4/-	13/9	—3d	22½ .	22½ 30	3 14 3* 2 17 9	16/- 59/3	13/9 51/3
Ward & Goldstone	***	5/-	52/-	+9d 6d	25 25	25	4 7 0	17/6	11/-
Watford	***	2/-	11/6 49/-	- Ou	10	11	4 9 9	59/9	49/-
Westinghouse	***	5/-	12/9	+3d	12 <del>1</del>	121*	4 18 0	17/-	14/-
West, Allen Wolf Electric	•••	5/-	12/-	+6d	10	121	5 4 3	13/3	10/9
THOR ELECTION									

and new shares, and is at the same rate of 10 per cent as was paid a year ago on the smaller capital. The other scrip issues have been made during the past decade, and on each occasion the dividend was subsequently left unchanged at a total of 20 per cent. Last year's earnings exceeded the amount of the dividend some  $3\frac{1}{2}$  times.

#### Southern Areas

The group profit of £66,000 reported by Southern Areas Electric Corporation for 1959 enables the company to re-enter the dividend list, with a payment of 5 per cent, after an absence of two years, and indicates successful results from the measures taken to restore the position after the £4,000 loss incurred in 1958. Actions taken then included the stopping of a drain on profits by the closure of production by two of the subsidiaries, and a concentration of effort on building up the others. The fit shares improved to 15s 6d and are now on a yield basis of approximately  $6\frac{1}{2}$  per cent.

#### **Rheostatic Progress**

Consistently good support for the 4s shares of the Rheostatic Co. during this year's spells of general market weakness find further justification in the progress statement issued by the directors in confirming their proposal for a onefor-three scrip issue. Satisfied with the position in the light of the first six months' trading results, they expect, for the full period ending next September, dividends totalling 183 per cent on the increased capital. This would be equivalent to 25 per cent on the present number of shares, or 5 per cent more than in 1958-59 and double the rate for 1957-58. The scrip issue comes up for approval today (Friday).

#### **Company News**

Atlas Electric & General Trust f.1 shares were raised to 85s 6d after the announcement of a proposed 100 per cent scrip issue, a 21 per cent improvement in net revenue last year and an increase in the dividend to a total of 15 per cent, which raises the yield on the shares to  $3\frac{1}{2}$  per cent. New shares offered to R. A. Lister shareholders stand at a premium of about 4s 9d on the issue price of 47s 6d; trading in the first six months of the current year is stated to have been better than in the corresponding half of 1958-59 and the final dividend on the larger capital is expected to be not less than the present rate of 9 per cent. Chloride Electrical Storage £1 shares have continued to be well supported since the appearance of the annual report, in which the chairman refers to a well-filled order book and higher sales in the first quarter of the year.

### REPORTS and DIVIDENDS

Metal Industries, Ltd., is considering plans to raise about £4 million by a "rights" issue of ordinary shares. The issue is primarily to replace the overdraft facilities granted by the company's bankers during the recent acquisition of Lancashire Dynamo Holdings, Ltd. The cash part of the acquisition cost about £5 $\frac{1}{2}$  million, including expenses, but as £2 million was available from short-term investments and other resources, there remains about £3 $\frac{1}{2}$  million on overdraft. To enable the issue to be made, it is proposed to increase the authorised capital of the company from £10 million to £15 million by the creation of an additional 5,000,000 shares of £1 each. An extraordinary general meeting of the company is to be held on 30th May to increase the authorised capital.

Richard Johnson & Nephew, Ltd.—Group profits for the year to 31st March last amounted to £1,938,499, as compared with £1,697,358 for the preceding year. Taxation absorbs £850,811, and the net balance is £1,087,688 (against £885,798). General reserve receives £297,276 and plant replacement reserve £500,000. It is proposed to pay a final dividend of  $7\frac{1}{2}$  per cent (against  $6\frac{1}{2}$  per cent), making 11 per cent (9 per cent) for the year.

Power Securities Corporation, Ltd.— The annual meeting will be held on 2nd June. In his review of 1959, which has been circulated, Sir Andrew MacTaggart (chairman and managing director) says that the Peace River Power Development Co., Ltd., with which they are associated, has presented its report on the proposed hydro-electric project, etc., on the Peace River, British Columbia, in which it states that the proposed development is feasible from an engi-The British neering standpoint. Columbia Government has accepted the findings in the report, and the Peace River Co. is in a position to make application for the required certificate and licence. The Power Securities Corporation has undertaken to subscribe for further shares in the Peace River Co. Work done by Balfour, Beatty & Co., Ltd., has been both varied and interesting. Staythorpe "B" power station contract for the C.E.G.B. is making excellent progress, the main building for the plant being practically complete. No. 1 120 MW turbine and No. 1 boiler, with ancillary works, should be commissioned this year. The transmission line department has been fully occupied and during 1959 erected in the United Kingdom over 500 miles of e.h.v. overhead lines and about 100 miles of lower voltage lines. Contracts in hand, some of which will not be completed this year, include 263 miles of 275 kV and 188 miles of 132 kV overhead lines, as well as a considerable mileage of lower voltage lines. Sir Andrew refers to activities of overseas companies and to those of companies in the group at home.

Matthew Hall & Co., Ltd.—The net profit for 1959, after providing £234,000 for taxation, is £252,231, as compared with £201,152 for 1958. It is proposed to pay a dividend for the year of 27½ per cent (against an equivalent of 15 per cent after allowing for a scrip issue). General reserve receives £100,000 and the balance carried forward is £128,047 (against £386,809 brought in).

The Southern Areas Electric Corporation, Ltd., reports consolidated profits for 1959 of £65,691, as compared with a loss of £3,846 for the preceding year. Taxation absorbs £21,888, and after adding £3,257 unrequired pensions provision, the net balance is £47,060 (against a loss of £5,153). It is proposed to pay a dividend for the year of 5 per cent (against nil) and to carry forward £163,277 (against £140,211 brought in).

The British Electric Transformer Co., Ltd., announces that the response to the offer made by C.P. Properties, Ltd., to purchase its preference shares at 20s per share has been satisfactory. The closing date of the offer has been extended to 3rd June.

The Atlas Electric & General Trust, Ltd., reports a net revenue for the year to 31st March last of £768,961, as compared with £634,815 for 1958-59. It is proposed to pay a final dividend of 11 per cent, making 15 per cent for the year (against an equivalent of 12-7 per cent after allowing for a scrip issue).

Dictograph Telephones, Ltd., is paying an interim dividend of 10 per cent (unchanged) on capital increased by a one-for-three scrip issue.

Relay Exchanges, Ltd.—Philip Hill, Higginson, Erlangers, Ltd., announce that arrangements are in hand for the placing of £1,500,000 6¼ per cent unsecured loan stock, 1979-84, second series.

#### **New Companies**

Monogram Electric, Ltd.—Registered 4th May. Capital £150,000. Electricians and electrical, electronic, chemical, mechanical, metallurgical, nuclear and general engineers, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

A, H. Percival & Co., Ltd.—Registered 2nd May. Capital £10,000. Manufacturers of and dealers in electrical goods of all kinds, etc. A. H. Percival is the first director. Regd. office: 54, Weibeck Street, W.1.

D. Robinson & Co., Ltd.—Registered 29th April, Capital £1,000. Manufacturers of and dealers in electrical components for automatic control, panel controls, etc. D. B. H. Robinson is permanent managing director. Regd. office: 717, London Road, Hounslow, Middlesex.

Tele-Reps, Ltd.—Registered 14th April. Capital £1,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: H. R. Blake, Mrs. Grace C. Blake, A. A. Livingstone, Mrs. Winifred M. Livingstone, D. E. M. Gardner and Mrs. Gertrude E. Gardner. Regd, office: Prudential Buildings, St. Andrews Street, Cambridge.

Wm. Bradshaw (Leeds), Ltd.—Registered 1st April. Capital £1,000. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: W. Bradshaw and Mrs. Hilda Bradshaw. Regd. office: 225, Selby Road, Leeds.

Avon Electrics (Hanwell), Ltd.—Registered 1st April. Capital £1,000. Directors: T. J. Bullock, T. C. Bullock and G. C. Stewart. Regd. office: 133, Uxbridge Road, W.7.

P. V. Flint, Ltd.—Registered 12th February. Capital £100. Manufacturers of and dealers in electrical goods, etc. Mrs. Pamela V. Flint is the first director. Regd. office: 83/5, St. Mary Road, E.17.

office: 83/5, St. Mary Road, E.17.

C.G.S. Resistance Co., Ltd.—Registered 28th March. Capital £100. Manufacturers of and dealers in electrical components and all kinds of electrical machinery and apparatus, radio and television engineers, etc. Directors: V. S. Chadderton and Mrs. Mary Chadderton. Regd. office: 30, Clarendon Road, Harrow, Middlesex.

Relay Damestic Appliances Ltd.—Regis

Relax Domestic Appliances, Ltd.—Registered 28th April. Capital £20,000. Manufacturers of and dealers in electro-domestic appliances, etc. Directors: F. Casarini, G. Frus and R. A. Butcher. Regd. office: Abbey House, Victoria Street, S.W.I.

Arden Electrical Co., Ltd.—Registered 5th February. Capital £2,000. Wholesalers and retailers of all kinds of electrical goods, etc. Solicitors: Band Hatton & Co., Coventry.

F. S. Boucher, Ltd.—Registered 18th February. Capital £10,000. To acquire the business of electrical contractors carried on by F. S. Boucher at Manchester as F. S. Boucher & Co., etc. Directors: F. S. Boucher, Mrs. Florence L. Boucher and P. M. M. Boucher. Regd. office: 11, Barton Street, Manchester, 3.

Leroy Electric Motors, Ltd.—Registered 17th February. Capital £5,000. Electricians, mechanical engineers and manufacturers of and dealers in electrical apparatus, etc. Directors: L. P. J. Castay, C. W. Smee and G. Chavane. Solicitors: Pollard, Stallabrass & Co., 12, Rochester Row, S.W.I.

Smith, Hubbard & Co., Ltd.—Registered 17th February. Capital £1,000. Electrical, radio and television engineers and contractors, etc. Directors: R. Smith and F. Hubbard. Regd office: 9, Palmyra Square, Warrington, Lancs.

Bournemouth Electric Machines, Ltd.—
Registered 17th February. Capital £100.
Manufacturers of and dealers in domestic appliances of all kinds, etc. Directors: L. A. D. Thomas and R. J. R. Coombes.
Regd. office: 229, Old Christchurch Road, Bournemouth.

Esbematic, Ltd.—Registered 18th February. Capital £1,000. Manufacturers of and dealers in electrical appliances and equipment of all kinds, mechanical, electrical, refrigeration and radio machines, etc. I. S. W.

[Continued on page 985



Accurate voltage control without wave-form distortion is essential to the efficient working of electrostatic dust precipitators. Sturtevant Engineering use Brentford regulators for this job: the regulators give completely reliable voltage control in all kinds of conditions for twenty four hours a day.

We make voltage regulators and power transformers of all sizes from 5 kVA to 15 MVA.

# **BRENTFORD**



Regulators

BRENTFORD TRANSFORMERS LTD. MANOR ROYAL, CRAWLEY, SUSSEX. TEL: CRAWLEY 25121

# KARIBA - Electrica

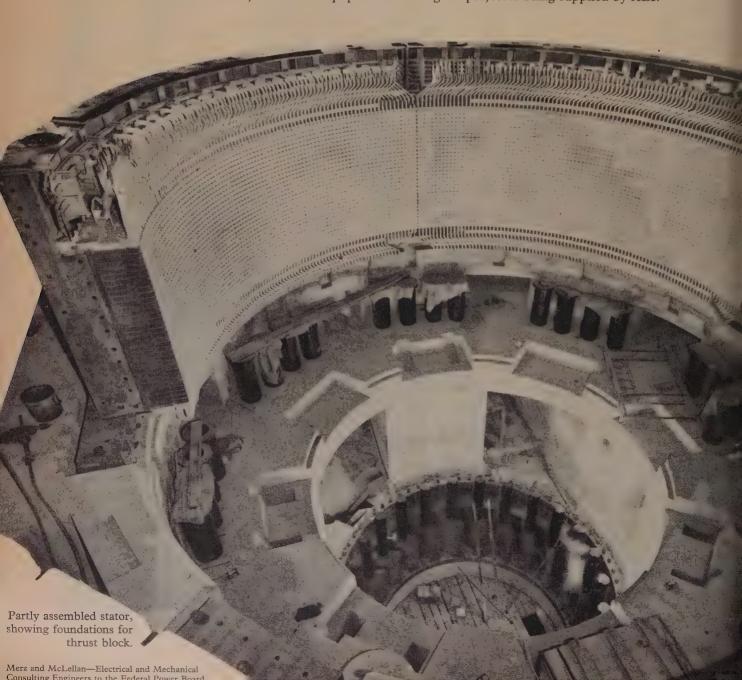
Three hundred miles downstream from Victoria Falls, where vast power goes to waste in a magnificent display, the waters of the Zambesi are being harnessed to supply electricity to the whole of Northern and Southern Rhodesia. The world's largest man-made lake, with an area bigger than the

whole of the county of Kent, will store sufficient water power to generate 8½ million MWh of electricity annually. When the first stage of the plan is completed in 1962, six 100-MW generators will operation. By the early 1970's it is planned to raise the total generating capacity to 1,500 MW.

From Kariba this power will be distributed to the growing industries

and cities of the Rhodesias and particularly to the Copper Belt.

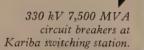
Much of the major electrical equipment for this great project is being supplied by AEI.



# gineering on the Grand Scale

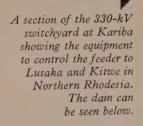
At the heart of this tremendous scheme are the six 100-MW AEI generators—the largest hydro-electric generators in Africa. Power is distributed at 330 kV which is the highest voltage to be used in the Southern hemisphere. For switching this power at Kariba and at the six sub-stations in Northern and Southern Rhodesia, AEI is to supply 25 oil circuit breakers, over 100 isolators and ancillary equipment.

AEI contracts also include the provision of 50 miles of cables, including control cables, co-axial and telephone cables and lead-covered cables for the underground power station.





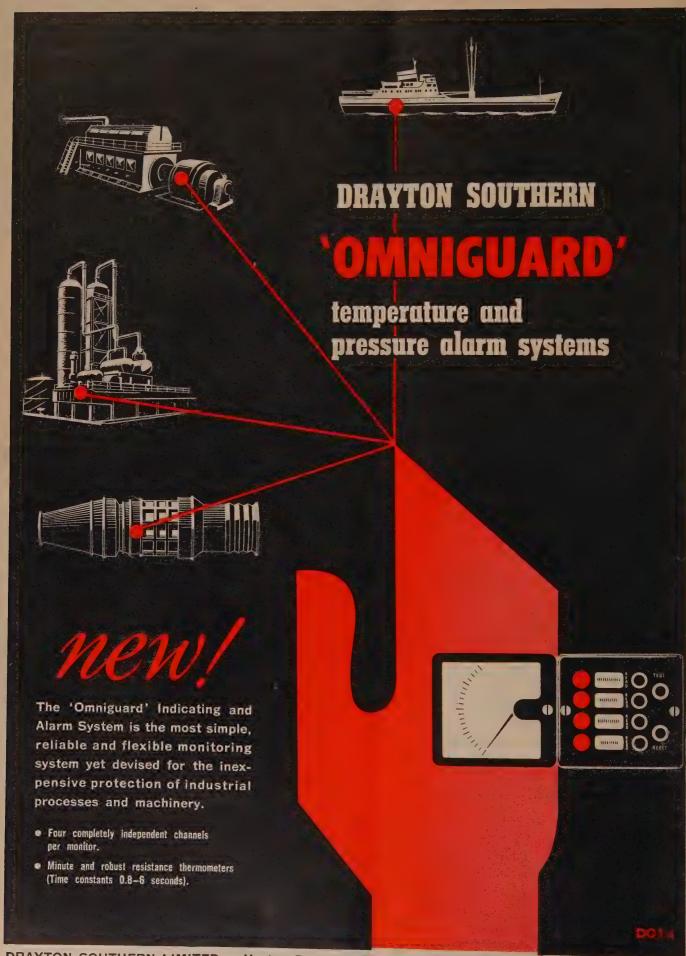
One of the six 100-MW generator rotors being lowered into its state





**Associated Electrical Industries Limited** 

33, GROSVENOR PLACE, LONDON, SW1



#### FINANCIAL SECTION (Continued)

Boros is the first director. Regd. office: 120, Bishopsgate, E.C.2.

F. Horn (Household Electrical Equipment), Ltd.—Registered 19th February. Capital Cioo. Distributors, wholesalers and retailers, nanufacturers of and dealers in vacuum cleaners, etc. Directors: F. Horn and H. Goodier. Regd. office: 55, Park Lane, W.I.

Radcliffe (Electrical Newquay), Ltd.— Registered 25th February. Capital £10,000. Manufacturers of and dealers in electrical and gas apparatus, catering equipment, etc. Directors: R. Radcliffe and Mrs. Dorothy I. E. Radcliffe. Regd. office: Morfa Hall, Cliff Road, Newquay, Cornwall.

Road, Newquay, Cornwall.

Wereco, Ltd.—Registered 24th February.
Capital £100. Designers, manufacturers, repairers, exporters and importers, hirers and letters on hire of and dealers in electrical apparatus, appliances, goods and accessories, spin dryers, washing machines, vacuum cleaners, radio and television apparatus, etc. Directors: M. J. O'Connor, T. Rice and R. H. Watts. Regd. office: 49, High Street, Houghton Conquest, Bedford.

E. H. Havill & Co. (Torquay), Ltd.—Registered 26th February. Capital £4,000. Electrical equipment specialists, etc. Directors: B. H. Havill and Mrs. Doris I. Havill. Regd. office: 76, Babbacombe Road, Torquay, Devon.

Devon.

Newmarket Electrical Distributors, Ltd.—Registered 24th February. Capital £100. Importers, exporters, distributors, and manufacturers of and dealers in electronic, radar, radio, television and scientific instruments, etc. Directors: G. J. Claremont, E. Gee, E. Benjamin and C. Z. Berger. Regd. office: 57, Blandford Street, W.1.

Goodway Machinery Co., Ltd.—Registered 23rd February. Capital £500. Electrical and mechanical engineers, etc. Directors: A. G. Gooding and R. A. Harding. Regd. office: 31, St. Nicholas Street, Bristol, 1.

Walter J. Parsons (Electrical Engineers), Ltd.—Registered 23rd February. Capital £500. Electrical, mechanical and general engineers, etc. Directors: W. Parsons and R. F. Jones. Regd. office: 127, Morville Street, Ladywood, Birmingham, 16.

Stephens Lighting, Ltd.—Registered 22nd February. Capital £100. Electrical engineers and contractors and producers in connection with film, television, radio, theatrical, dramatic, musical and other productions, etc. Directors: G. Smith, E. J. Davis and R. W. Paynter. Regd. office: 111, Longhill Road,

Perryvale Electrical Appliances, Ltd.— Registered 22nd February. Capital £1,000. Electrical, radio, television and refrigeration engineers, etc. Directors: D. M. Hurley and G. A. Coker. Regd. office: 68, East Avenue, Hayes, Middx.

Electoleisure, Ltd.—Registered 22nd February. Capital £1,000. Manufacturers of and dealers in all kinds of domestic appliances, etc. Directors: W. G. Biggs and E. C. Biggs. Regd. office: 174, High Street, Hounslow.

Neonrite, Ltd.—Registered 22nd February. Capital £500. Manufacturers of and dealers in electric lamps, neon tubes, etc. Regd. office: 18, Harecourt House, 19, Cavendish Square, W.I.

Powis Electrical Co., Ltd.—Registered 22nd February. Capital £5,000. Electrical engineers, etc. Directors: J. Levy and Hannah Levy. Regd. office: 170, St. John Street,

Clough Bros. (Clayton), Ltd.—Registered 22nd February. Capital £2,000. Electrical engineers, etc. Directors: N. E. Clough and T. H. Clough. Regd. office: 162, Whalley Road, Clayton-le-Moors, Accrington.

Dominion Valve & Tube Co. (Leeds), Ltd.

Registered 22nd February. Capital £500. Electricians, electrical, mechanical, television and radio engineers, etc. Directors: F. Laking and J. S. Bell. Regd. office: 81, Raglan Road, Leeds.

Marlite, Ltd.—Registered 22nd February.
Capital £100. Manufacturers, importers and exporters of and dealers in electrical discharge tubes, X-ray valves and tubes, high frequency

vacuum tubes, etc. V. Kano is the first director. Regd. office: 47, Oxford Street, W.I.

Vogue Electrics, Ltd.—Registered 22nd February. Capital £750. Electricians, etc. Directors: L. Clark, S. C. Barkway and D. P. Albiston. Regd. office: 64, High Street, Chislehurst, Kent.

R. Jarman, Ltd.—Registered 28th March. Capital £100. Electrical engineers and contractors, manufacturers, importers and exporters of and dealers in electrical instruments, radio apparatus, etc. Directors: R. Jarman and Amy C. Jarman. Regd. office: I, Meadowbrook, Dorking, Surrey.

E. V. Bullen & Son, Ltd.—Registered 21st
March. Capital £2,000. Electrical and
general engineers and contractors, etc.
Directors: J. G. Bullen and Mrs. Dorothy
Bullen. Regd. office: 85/7, Hither Green Lane, S.E.13.

Tele-Centre (Aldershot), Ltd.—Registered 21st March. Capital £2,000. Electrical engineers, etc. P. Spitz is the first director. Regd. office: Hascombe, Brooklyn Road,

Burndept Holdings, Ltd.—Registered 22nd March. Capital £100. Manufacturers of and dealers in radio and television equipment, etc. Solicitors: Herbert Oppenheimer & Co., 20, Copthall Avenue, E.C.2.

Faylite, Ltd.—Registered 1st March. Capital £100. Manufacturers, repairers and hirers out of and maintenance for and dealers in neon, fluorescent and illuminated and non-illuminated signs, etc. Directors: F. W. Fay and Patricia Woodcock. Regd. office: 243, Farm Street, Hockley, Birmingham, 19.

E. H. & V. Moore (Glass), Ltd.—Registered 15th March. Capital £1,000. Manufacturers, importers and exporters of and dealers in radio valves, cathode ray tubes, incandescent bulbs, etc. Directors: E. H. Moore and Mrs. Victoria Moore, both of 4, Walton Lane, Weybridge, Surrey.

Insta-Heat, Ltd.—Registered 23rd March. Capital £100. Manufacturers of and dealers in electrical and electronic apparatus, etc. Directors: T. E. Styrin and L. Newton. Solicitors: Emsley & Son, Leeds, 1.

Brytarc, Ltd.—Registered 23rd March. Capital £2,500. Manufacturers of and dealers in electrical apparatus, etc. Directors: M. Rivlin and Mrs. Estelle Rivlin. Regd. office: 642, Scott Hall Road, Leeds, 17.

#### Bankruptcies

P. J. Ferris, 5, King's Road, Canton, Cardiff, trading as Ferris Domestic Appliances, electrical dealer.—Receiving order made 4th May on a creditor's petition.

J. E. White, electrical engineer, carrying on business as Woodall & White and as Electraders at 42, Lawrence Lane, Old Hill, Staffs.

—Receiving order made 2nd May on debtor's own petition. Public examination 16th June at the Court House, Priory Street, Dudley.

E. Bowes, 3, Front Street, Langley Park, Durham, radio and electrical engineer.—
Trustee, Mr. F. P. Hunnam, 30-32, Grey Street, Newcastle-upon-Tyne, 1, released roth April 19th April.

L. G. Brown, lately carrying on business at 31a, Colin Road, Luton, dealer in household and electrical equipment.—Trustee, Mr. H. C. Hedges, 4, Charterhouse Square, London, E.C.1, released 1st April.

G. Dickinson and K. G. Dickinson, carrying on business in partnership under the style of G. & K. G. Dickinson at 134, Clipsley Lane and 321, Church Road, Haydock, Lancs., electricians.—Last day for receiving proofs for dividend 25th May. Trustee, Mr. S. O. Henry, 4, Rumford Place, Liverscel 2.

K. G. Richards, trading with another as Southern Electrical Appliances, 21, Redcliff Drive, Leigh-on-Sea, dealer in domestic appliances, lately carrying on business at Warrior House, Warrior Square, Southendon-Sea.—Public examination 5th July at 102, Alexandra Road, Southend-on-Sea.

C. E. Purcell, 81, Addison Road, London, W.14, electrical contractor, lately carrying on business at 13, Wrotham Road, Gravesend,

under the style of Edward Purcell & Son.— Last day for receiving proofs for dividend 25th May. Trustee, Mr. T. A. Tuck, 40, St. Margaret's Street, Rochester, Official Receiver.

#### Liquidations

Northern Infra-Red Manufacturing Co., Ltd., electricians, electrical and mechanical engineers, Wright Street, Oldham.—Winding up woluntarily. Liquidator, Mr. A. T. Eaves, 47, Mosley Street, Manchester, 2, appointed 26th April. Particulars of claims to the liquidator by 7th June.

Fro Condenser Co., Ltd., 167-170, Ravens-court Arches, London, W.6.—Winding up voluntarily. Liquidator, Mr. J. L. Guy, 15, Cullum Street, Fenchurch Street, London, E.C.3, appointed 4th May. Particulars of claims to the liquidator by 25th May.

Loughton Radio & Electrical Co., Ltd.—Particulars of claims by 27th May to the liquidator, Mr. L. J. W. Gould, 88, Leadenhall Street, London, E.C.3. This notice is purely formal. All known creditors have been, or will be paid in full.

#### TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 4th June:—
Sterophoner. No. B790,184. Class 9. Radio/electronic apparatus and parts; and sound amplifiers.—Symphony Amplifiers, Ltd., 42, Tottenham Street, London, W.I.
Conex. No. 791,519. Class 9. Connectors, stand-off and feed-through terminals; pluss. probes. taper-pin receptacles, test-

tors, stand-off and feed-inrough terminals; plugs, probes, taper-pin receptacles, test-point jacks and printed circuit jacks, all being electronic components.—Sealectro Corporation, Mamaroneck, N.Y., U.S.A. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.I.

Chimel. No. 794,512. Class 9. Electric condensers and electronic semiconducting devices.—Chimel S.A., Geneva, Switzerland. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London, E.C.I.

Numicator. No. 799,395. Class 9. Electric discharge tubes (not for lighting purposes).
—Hivac, Ltd., Stonefield Way, Victoria Road, South Ruislip, Middx.

Vitalite. No. 791,458. Class 11. Lighting installations and aluminium reflectors.—Slemens Edison Swan, Ltd., 33, Grosvenor Place, London, S.W.I.

#### **CATALOGUES AND LISTS**

ADHESIVES.—Catalogue (36 pages) containing information on the "Holdtite" range of industrial adhesives.—Surridge's Patents, Ltd., Croydon Road, Beckenham, Kent.

BEARINGS.—Catalogue containing par-ticulars of oil-retaining bearings.—Bound Brook Bearings, Ltd., Trent Valley Trading Estate, Lichfield, Staffs.

INSULATING MATERIAL. — Leaflet (1144) on "Rosite" cold compression-moulded insulating material.—Rosite, Ltd., Cheney Manor, Swindon, Wiltshire.

LAMPS.—Leaflet giving data on a r kW high-pressure mercury lamp intended for industrial lighting purposes.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

LIFTING EQUIPMENT. — Handbook (23) describing the "MonoRail" overhead materials handling system and illustrating applications in various industries.—British MonoRail, Ltd., Wakefield Road, Brighouse,

LIGHTING FITTINGS. — Brochure covering the range of "Litemaster" fluorescent lighting fittings.—Benjamin Electric, Ltd., Brantwood Road, Tottenham, London, N.17.

PHOTO-ELECTRIC EQUIPMENT.—
Two leaflets dealing with an invisible ray burglar alarm and an automatic lighting control unit.—Radiovisor Parent, Ltd., Stanhope Works, High Path, London, S.W.19.

## NEW ELECTRICAL EQUIPMENT

#### **Bottle Cooler**

The new "Squareline" self-contained bottle cooling shelf, available from G.V.E., LTD., 231, Strand, London, W.C.2, fits on an existing shelf or counter and has only to be plugged into a convenient 5 A

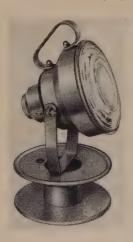
ing is effected through the back of the reflector and the focusing adjustment and lampholder connections are completely encased in a detachable weatherproof housing. This model is suitable for use with 38 mm vehicle bulbs, and is priced at 132s. It is also



socket-outlet. A  $\frac{1}{6}$  h.p. "Tecumseh-Sternette" sealed refrigeration system is fitted and the temperature is thermostatically controlled. The complete unit is nearly  $5\frac{1}{2}$ ft long by  $16\frac{3}{4}$ in wide and has a capacity of approximately ten dozen bottles. The finish is in "Formica" with aluminium trim. The unit is suitable for use on 220/240 V a.c. supplies and the price is £74 10s.

#### Movable Floodlight

A transportable floodlight has been announced by ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, 18. The No. 563 l.v. heavy-duty lantern is mounted on a steel drum for the trailing cable and has a carrying handle.



R.E.A.L. portable floodlight

A parabolic reflector is permanently sealed into position between the front glass and the body member. Re-lampoffered mounted on a bracket for screwing permanently into position, without carrying handle and cable drum. The list number of this model is 562 and the price 112s.

#### Voltage Regulator

A Mark III model of their "Interstep" regulator has been announced by Brentford Transformers, Ltd., Crawley, Sussex. The equipment gives stepless on-load control of voltage over the whole voltage range up to 11 kV with regulating capacities up to 5.6 MVA. The regulating unit is associated with a main transformer and comprises a selector-divertor switch, a small Brentford regulator, a mid-point booster transformer and a driving motor with a co-ordinating gearbox. The operation of the Mark I "Interstep" regulator was described in our issue of 26th December, 1959. The new Mark III unit operates under the same principles, but the separate selector and divertor switches are replaced by a combined switch. This switch is air-cooled and is now more accessible for maintenance. control unit has also been simplified by replacing the three separate motors with a single driving motor and gearbox.

## Thermo-setting Silver Preparations

Research work carried out in collaboration with CIBA (A.R.L.), Ltd., has led to the development by Johnson, Matthey & Co., Ltd., 73-83, Hatton Garden, London, E.C.I., of two additions to the JMC range of thermosetting silver preparations. Both these preparations are based on "Araldite."

FSP43 is a surface-coating preparation for application by brushing: FSP49 is a conducting cement. Each is supplied in the form of two separate components which are mixed together immediately before use.

The mixed components must be cured at a minimum temperature of 80°C and will adhere to most materials that are capable of withstanding this temperature, including glasses, ceramics, graphites and many plastics. The films, after curing, are extremely hard, have high electrical conductivity and are highly resistant to water and organic solvents. The film produced by FSP43 can also be electroplated in many conventional acid baths.

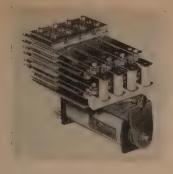
#### Remanent and Heavy Duty Relays

Recently announced by L. E. SIMMONDS, LTD., 5, Byron Road, Harrow, Middx., is a remanent relay based on the Post Office Type 3000 design, but fitted with a remanent core. After energising, the relay will remain latched and can only be returned to the non-operate position by a reverse polarity pulse where a single coil is employed, or by passing current through a second winding on the same coil. Also introduced is the series 700 relay designed for heavier duties than the standard P.O. Type 3000 relay. The frame, armature, and coil are identical but the contact buildup enables up to eight change-overs to be fitted, each rated at 15 A, 250 V a.c. or 440 V at 5 A. All moving parts are of polytetrafluorethylene.

#### Fuse Failure Relay

A simple form of fuse failure relay has been added to the range of protective and auxiliary relays manufactured by the ENGLISH ELECTRIC Co., Ltd., Marconi House, Strand, London, W.C.2. When a voltage transformer fuse is omitted, removed or fails, this relay will prevent incorrect operation of equipment such as a distance protection scheme. The advantage is that only one additional contact is introduced into the trip circuit.

The relay consists of three hinged armature units, one of them having a pair of contacts. These contacts are self-reset, with one normally open and one normally closed. Each of these three units has an extension piece secured to its armature and the units are so arranged that the closing



Simmonds series 700 relay



English Electric fuse failure relay



Metway "Coolerway-Royal" extractor fan



Pentechnique 4-dekatron tachometer



Tooley "Pigmy" portable generator



Multitone telephone amplifier

of any armature will operate the contacts. Each of the fuses to be protected has one of the hinged armature unit operating coils connected in parallel and the normally closed contact in series with the trip circuit. The alarm circuit is completed by the normally open contact.

#### **Extractor Fan**

The new "Coolerway-Royal" extractor fan, just introduced by METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Brighton, 7, has a rather more streamlined appearance than the company's original "Coolerway." It can be used in either a horizontal or vertical position and the price is £6 198 6d.

#### Electronic Tachometer

The 4- and 5-dekatron tachometers announced by Pentechnique, Ltd., Imperial Lane, Cheltenham, Glos., can be supplied in a variety of forms. Provision can be made for several input signals and up to ten timing periods—selection being made by a single rotary switch. Illustrated is a new version to measure (to an accuracy of ±1 r.p.m.) the shaft speed of an a.c. generator by counting the 15 cycles per rev. electrical output of the generator for an accurate 4 sec period. The readings are repetitive and after a 2 sec

display period the dekatrons automatically reset and proceed to take a further count. The display period can be extended by the "hold display" switch which can be operated at any time during the counting or display process. Only 12 valves and three selenium diodes are used, in addition to the dekatrons, in a housing only  $9\frac{1}{4}$ in by  $7\frac{1}{4}$ in by  $7\frac{1}{2}$ in deep. Prices of the 4- and 5-dekatron tachometers are £198 10s and £222 10s respectively.

#### Battery Charging/Lighting Set

The "Pigmy" battery charging and lighting set developed by the TOOLEY ELECTRO MECHANICAL Co., LTD., comprises a I h.p. Villiers four-stroke petrol engine with mechanical governor, fuel tank, air filter, exhaust silencer, flywheel magneto and top mounted vee belt driven generator. This 18 A 12 V d.c. machine is provided with a reverse current relay, charging regulator, centre zero ammeter, heavy duty terminals and two leads each 3ft long with spade terminals and battery clips.

The generator is protected by a sheet steel shroud while the pulleys and driving belt are completely guarded. A sheet steel base with four anti-vibration mountings supports the unit, the weight of which is approxi-

mately 50 lb complete and packed in a wooden box. Optional extras include an acoustic exhaust silencer, recoil starter and totally enclosed floodlight lamps to mount above the unit.

#### Telephone Amplifier

Although the "Clarafon" has been designed by the MULTITONE ELECTRIC Co., LTD., 12-20, Underwood Street, London, N.1, for amplifying the voice of a caller to permit those hard of hearing to use the telephone, it is also of assistance where the telephone has to be used in noisy surroundings. The attachment, which can be carried in the pocket and clipped on to the telephone, is a three-stage transistor amplifier in a moulded nylon case operated by two small mercury batteries giving a life of some 1,600 three-minute telephone calls. There is an on/off switch and a volume control. It weighs only just over 2 oz and is of the same diameter as the handset earphone and o-7in deep. The price, with two batteries, is 14 gns.

#### **British Computer Society**

The annual conference of the British Computer Society will be held from 4th to 7th July in the Sun Pavilion, Harrogate.

### **GENERATION and DEVELOPMENT**

#### Cheaper Domestic Off-peak Supplies

The Southern Electricity Board is reducing its standard domestic off-peak tariffs by 0-1d/kWh from the first normal meter readings after 30th June. This change will bring the domestic tariffs into line with those to non-domestic premises at the cost of fuel for 1961-62 as estimated by the Central Electricity Generating Board.

#### Pattern for Power

The Central Electricity Generating Board has recently produced a booklet entitled "Pattern for Power," dealing with the grid and supergrid systems. The need for a supergrid is discussed, reference is made to the cross-Channel cable and the difference in the cost of underground cables and overhead lines is explained. The final section of the booklet deals with technical details of the system, substation, switchgear and transformer design.

#### Clarence Dock Emissions

Professor A. B. Semple, medical officer of health, Liverpool, has reported to the Council that the C.E.G.B. is carrying out work designed to reduce the emission of fumes from the Clarence Dock power station. He said it was hoped that work to be done during the summer months would be effective. The power station is 29 years old and as more efficient stations have been brought into service, it is expected that the demands made upon it will be lessened except at peak load periods.

#### Disposal of Colliers

The South Shields correspondent of *The Times* says that the Central Electricity Generating Board, which has been allowing its collier fleet to run down for two years, is to dispose of three more vessels—the *Pompey Power*, *Bodmin Moor* and *Brent Knoll*. The last two have already been laid up for some time.

#### Glasgow Redevelopment

When the Pollokshaws area of Glasgow is redeveloped, at a cost of £7 million, it will include a 22-storey, 200ft high block which will be the tallest building, residential or commercial, in Scotland. This block and four others ranging from 10 storeys are included in the first phase of the scheme approved by the Corporation Housing Committee on 9th May. Electric underfloor heating will be

provided but it is intended to have gas heating in some of the dwellings. Work on the first phase will begin towards the end of this year and take three years to complete. The second is now being planned and the whole scheme will be completed in about ten years.

#### Service Centre Competition

For the second successive year, Plymouth Service Centre has won the Frank Forrest Silver Trophy for the brightest and most attractive display in a large electricity service centre in the South Western Electricity Board's area. The winning team from the New George Street (Plymouth) service centre were: Messrs. H. M. Pope, A. B. Horrell and E. A. Denbow. Torquay were again runners-up and Ilfracombe came third. Bedminster (Bristol) won the display challenge cup for smaller service centres. The team were: Mr. P. G. Locke, Miss M. F. Thomas and Mrs. M. V. Crook. The runners-up were: the one-man service centre at Plympton, near Plymouth (Mr. W. A. Wren in charge), and Exmouth service centre.

#### Area Boards' Domestic Appliance Sales

The latest return issued by the Electricity Council shows that Area Boards' sales of all the main types of domestic appliances except washboilers improved in March and the

Type of Appliance		ended March	Twelve months ended 3ist March			
	Total	Change %	Total	Change %		
Cookers Water Heaters:	32,693	+ 15.2	345,923	+ 21.2		
Immersion	15,872 7.218	+ 26·7 + 59·4		+ 16.4		
Storage Wash Boilers Washing	5,428	- 6.0		+ 24·1 - 16·1		
Machines Refrigerators	12,116 9,910	+ 21·1 + 92·9	161,996 172,539	+ 28·2 +108·7		

percentage gains were also greater than in February. The figures given, of course, represent only a part of the total sales throughout the country.

#### Meter Experiments

The Midlands Electricity Board is experimenting with outdoor meters. They are being built into the walls of some new houses in North Staffordshire and will save meter-readers having to return to houses when the occupants are out. The meter is a normal type enclosed in a glass-fibre case with an observation window.

It was reported at a meeting of the

Eastern Electricity Consultative Council last week that the Board proposed to experiment with estimated meter readings in the Peterborough and Lowestoft areas. The chairman (Ald. W. J. Bennett) said that the reason given was the difficulty of properly staffing the meter department. There would be two actual and two estimated readings a year.

#### New Workington Offices

The North Western Electricity Board has opened new offices costing £36,000 at Workington (Cumberland) to serve the West Lakeland District. The official opening was performed by Mr. J. Westoll, chairman of Cumberland County Council. Since 1948 £2,500,000 has been spent on capital works in the West Lakeland District. More than 740 farms have been supplied with electricity.

#### Barra and North Uist Supply

Last week Inverness County Council was asked by Mr. Michael Baillie, a nephew of the Prime Minister and a large landowner in the county, to press for a public inquiry into the operations of the North of Scotland Hydro-Electric Board. The suggestion, however, was refused by 35 votes to seven. Mr. Baillie made his proposal after the Council had been told that the Board had not provided an electricity supply to the Hebridean islands of Barra and North Uist because of the high cost involved and the loss that would be incurred.

A letter from the Scottish Home Department, written on the instructions of the Secretary of State for Scotland, stated that the capital cost of providing electricity in these islands would be about £750,000 and the Board estimated that in providing such a supply it would incur a loss each year of about £60,000 to £70,000. The Board, it was added, had to consider the needs of other areas without a supply and was very concerned about the problem of connecting them.

The County Council at its previous meeting had suggested that a special Government grant should be made to the Board to permit electricity to be supplied to Barra and North Uist.

The county convener, Mr. F. W. Walker, said they should not give up hope that Barra and North Uist would get electricity. It would take time. It was the policy of the Board to carry

[Continued on page 989



Variac Reg. Trade Mark

the original continuously-adjustable autotransformer

with the Exclusive

Duratrak

Reg Theor Mark, PAT. 453406

Contact Surface

The New issue of our Catalogue (VAR-5), pages 14 and 15 show a large range for operation on frequencies between 50 and 2,600 cycles. "Variacs" for ship and aircraft service are covered by this selection, which also includes small, low voltage toroidal models designed for 50 cycles.

Any of these "Variacs" may be ganged for three phase operation, giving voltage regulation down to zero volts.

A number of models provide a useful over-voltage feature which can be readily employed to give a steady output at the maximum end from a varying supply.

NITH ELECTRIC COMPANY LTD.

ZENITH WORKS, VILLIERS ROAD, WILLESDEN GREEN, LONDON, N.W.

Telephone: WILlesden 6581-5 Telegrams: Voltaohm, Norphone, London

MANUFACTURERS OF ELECTRICAL EQUIPMENT INCLUDING RADIO AND TELEVISION COMPONENTS



## Accent on Accuracy

#### WITH THE TYPE NF SERIES

The type NF3 (two-element) and NF4 (three-element) watt-hour and maximum demand meters have been designed to meet present day requirements for overall accuracy. Their easily accessible adjustments, lightweight construction and handsome appearance, will commend themselves to all users. The meters comply in all respects with British Standard 37: Part 4: 1954 and Part 5: 1955.



Type NF3 two-element watt-hour meter



Type NF4 three-clement maximum demand meter

For further information please write for 'The Art of Metering', which gives full details of these meters, to your local A.E.I. office or direct to:



Associated Electrical Industries Limited INSTRUMENTATION DIVISION - Instrument & Meter Department Trafford Park, Manchester 17

out development where possible and obtain additional revenue which in turn was helping to improve the position.

#### Uskmouth "B," Power Station

The construction of the Usk water outfalls for the new Uskmouth "B" power station at Newport, Mon., is to start shortly. The new station, alongside Uskmouth "A," is due to be commissioned at the end of this year. Dredging operations in the River Usk will begin in about a month.

#### **OVERSEAS**

#### Scholarships for Uganda Students

Under a scheme sponsored by the Uganda Electricity Board selected engineering students at the Royal Technical College, Nairobi, will be eligible for U.E.B. scholarships enabling them to pursue post-graduate training with manufacturers in the

United Kingdom. The new scheme is designed to encourage a greater interest in electrical engineering careers among Uganda's engineering students. It supplements the Board's existing scholarship and graduate apprenticeship schemes, under which locally born graduates are already following courses of training approved by the Institution of Electrical Engineers.

#### Transmission Towers

A new type of aluminium transmission tower which can be erected by one crew in seven minutes has been employed by the Aluminum Company of Canada, Ltd., for installation in one of the 345 kV transmission lines connected with Alcan's new Chutes-des-Passes power station, Quebec. The aluminium weight of a 96ft high tower is only 2,400 lb and the guyed-tower principle, linked to the aluminium structure, offers marked savings over its rigid counterpart. The transmission tower, which will stand



Aluminium guy-wired transmission tower developed by the Aluminum Company of Canada, Ltd.

securely even if a guy-wire breaks, is erected from a pre-assembly position on the ground.

#### PARLIAMENTARY REPORT

THE President of the Board of Trade understood that there were good prospects of final agreement during the month on a new European standard for coloured cables for domestic electrical appliances, said Mr. J. Parliamentary Secretary, Rodgers, Board of Trade, in the House of Commons last week. He had been asked about the progress being made in this matter and whether the importation of foreign appliances would be prohibited until agreement was reached. Mr. Rodgers said the President had no powers to impose such a prohibition or to introduce regulations or compulsory markings. The recommendations of the Committee on Consumer Protection were now under consideration.

Mr. Whitlock said the Minister appeared to be shockingly complacent about this subject. It was extremely urgent and the Minister should not wait for international agreement before acting.

Mr. Rodgers said the forcefulness of the Committee's remarks on this topic was recognised, but the matter could not be considered in isolation from the recommendations on general legislation.

Mr. Darling asked if it was possible for the Board of Trade to have consultations with the importers, or their trade associations, to try to get some satisfactory voluntary arrangements about informative markings. Mr. Rodgers said he would look into that possibility.

#### Yorkshire Power Stations

Asked what plans had been approved, under the capital development plan, for building further generating stations in South Yorkshire, the Parliamentary Secretary to the Ministry of Power, Mr. George, said generating stations were now being built at Thorpe Marsh, near Doncaster, and at Skelton Grange, near Leeds, but the Minister had not received any applications to build further stations in Yorkshire.

#### Loudspeaking Telephones

The Postmaster General, Mr. Bevins, said it was hoped that loud-speaking telephones, which would enable people to listen to conversations without holding the instrument, would be on the market later this year. There would be three types of equipment and his present information was that the rentals would range from about £8 to £20 a year.

#### A.E.A. Contract

The Minister for Science was asked whether he had approved the terms of a contract, estimated at £1,750,000, entered into by the Atomic Energy Authority with an unnamed manufacturer, to supply a chemical

unobtainable in bulk from any other firm, on conditions which guaranteed a minimum profit of 17 per cent in the first year rising to 45 per cent in the fifth year, and what efforts were being made to provide alternative supplies. The Minister of Education, Sir David Eccles, replying, said the Public Accounts Committee would shortly have the opportunity of hearing evidence on the Comptroller and Auditor General's report from the accounting officer for the atomic energy vote and the chairman of the A.E.A. It would be better to wait for the outcome of the committee's deliberations.

#### RUSSIAN WELDING TECHNOLOGY

Submerged arc, resistance, electroslag and gas shielded arc welding is being adopted as the basis for welding mechanisation in Russia, and a series of articles on these methods is published monthly in Avtomaticheskaya Svarka and Svarochnoe Proizvodstvo. Complete English translations of these two journals are published by the British Welding Research Association under English titles of "Automatic Welding" and "Welding Production." These journals are available at an annual subscription of £10 10s and £5 respectively from the Publications Department, B.W.R.A., Abington, Cambridge.

#### **NEW PATENTS**

#### Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1945

34829. Ohlinger, L. A., Wigner, E. P., Weinberg, A. M., and Young, G. J.—Fluid cooled nuclear reactor. 21st December, 1945.

Young, S. G.-Mounting blocks 36233. for electric switches, ceiling roses and like fit-tings. 1st March, 1956. (834222.)

4071. Henley's Telegraph Works Co., Ltd., W. T.—Joining of electrical conductors. 10th February, 1956. (833625.)

10th February, 1950. (055025);
9926. Plessey Co., Ltd.—Electrical capacitors. 28th March, 1956. (833984.)
15082. Electric & Musical Industries, Ltd.—Electric circuit arrangements embodying electron discharge valves and electron ing electron discharge valves and electron discharge valves for use therein. 25th May, 1956. (833429.) 18416. Indirectly heated cathodes for electron discharge devices and heater elements therefor. 11th June, 1956. (833432.)

15584. British Oxygen Co., Ltd.—Electric arc welding. 7th May, 1956. (833985.)
17156. Lister & Co., Ltd., R. A.—Electrical generating plant. 14th June, 1956. (834212.)

18789. M. & C. Switchgear, Ltd.—Electric timing relays. 14th June, 1956. (833482.)

20266. Igranic Electric Co., Ltd.—Plunger tuated electric switches. 10th August, actuated 1956. (833435.)

24439. Roe & Co., Ltd., A. V.—Electronic digital convertors. 16th August, 1956. (834215.)

25558. Hilger & Watts, Ltd.—Device for comparing light intensities. 28th September,

28651. Electrical Lock Engineering Co., Ltd.—resistors. 7th January, 1957. resistors. (833634.)

28970. British Insulated Callender's (Submarine Cables), Ltd.—Manufacture of multicore electric cables. 10th October, 1956.

30941. British Thomson-Housto Ltd.—Cubicle type switchboards. October, 1956. (833635.) British Thomson-Houston Co.

32294. English Electric Co., Ltd.—Automatic voltage control systems. 9th November, 1956. (833637.)

32624. English Electric Co., Ltd.—Electric circuits. 14th November, 1956. (833993.)

Unidare, Ltd., and Greer, P. H.-Safety devices for preventing overheating of electric storage heaters. 7th March, 1956.

Electric & Musical Industries, Ltd. 1331. Electric & Musical Industries, Ltd.
—Methods of securing coaxial cables to circuit panels. 20th December, 1956. (833639.)

Cosmocord, Ltd.—Electromechanical transducers. 29th April, 1957. (833640.)

7726. Steatit-Magnesia A.G.-Magnetically soft ferrites having rectangular l loops. 12th March, 1956. (834230.)

8796 and 9912. Hughes & Co., Ltd., F. A.
—Cathodic protection of metal structures.
5th March, 1957. (833483/4.)

9359. British Thomson-Houston Co. Cooling of dynamo-electric machines. March, 1957. (834232.)

10595. United Kingdom Atomic Energ Authority.—Nuclear reactors. 1957. (833647.)

12030. Technical Ceramics, Ltd.—Bending mode electromechanical transducer. April, 1956. (834236.)

13054. National Research Development Corporation.—Cathode-ray tubes. 27th April, 1956, (833999.)

Siemens-Schuckertwerke A.G. Semiconductor devices. 30th April, 1956.

Sylvania Electric Products, Inc 15295. ynamic phase shifter. 16th May, 1956. (833443.)

15645. Plessey Co., Ltd.—Continuous melting and casting of heat-fusible electrically conductive material. 16th August, 1957. (Cognate application 38521, 18th December, 1956.) (833661.)

15861. Feller A.G., A.—Electric tumbler switch. 22nd May, 1956. (833492.)

16372. Telefunken G.m.b.H.-Production semiconducting crystals. 28th May, 1956. (833448.)

16484. General Electric Co., Ltd.— Rectifier assemblies. 28th May, 1957. (833495.)

16864. General Electric Co.—Magnetic amplifiers. 31st May, 1956. (834009.) Garrett Corporation.—Electrical

analogue computer applicable to determina-tion of the angle of attack of an aircraft. 7th June, 1956. (834245.)

17795. Philips Electrical Industries, Ltd.—Devices for measuring liquid flow. 8th June, 1956. (834011.)

17919. Kienzle Apparate G.m.b.H.—Process and apparatus for generating series of electrical pulses. 11th June, 1956. (833454.)

18101. Statham Laboratories, Inc.-Transducer. 12th June, 1956. (833449.)

18368. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units and a method of regulating superheat and reheat temperatures. 14th June, 1956. (834012.)

18762. Companhia Portuguesa Radio Marconi.—Electric multichannel pulse com-munication systems. 18th June, 1956. (834247.)

General Electric Co.-Electric 20062. cables. 28th June, 1956. (834015.)

21082. Siemens-Schuckertwerke A.G.— Methods for producing a mica-based insulat-ing coating on a magnetic lamination or on a condenser electrode. 6th July, 1956. (833504.)

21333. CKD Modrany, Narodni Podnik Novotny, B., and Rybar, V.—Electric circuit-breaker with a metal quenching chamber. 10th July, 1956. (834018.)

21923. General Electric Co.—El oscillators. 16th July, 1956. (833677.)

22073. Bailey Meters & Controls, Ltd.-Incandescent electric lamp means for producing a stabilised or controlled light flux. 17th July, 1957. (834021.)

22759. Harmer, H. M., and Cook, F. J.-Charging of secondary batteries. 18 October, 1957. (834022.)

Realisations Ultrasoniques.-Cathode-ray display device for recurring pulses. 24th July, 1956. (833645.)

Thorn Electrical Industries, Methods of applying a luminescent coating to a surface and coated surfaces when prepared by the methods. 28th May, 1957. (834024.)

11. Philco Corporation.—Soldering of to circuit panels. 9th August, 1956. 24411. (833754.)

26206. Siemens-Schuckertwerke A.G. Rectifying circuits. 27th August, 1956. (833507.)

Kaplan, S. H.-Electron discharge devices used for picture reproduction in colour television systems and methods of manufac turing such devices. 5th September, 1956. (834030.)

28793. Pye, Ltd.—Phase-shifting device for transmission lines. 9th September, 1957.

28923. Rank Cintel, Ltd.—Apparatus for the control of a.c. 20th September, 1957. (834032.)

Philips Electrical Industries, Ltd. —Methods of sealing together two glass objects. 28th September, 1956. (834267.)

30050. South Wales Switchgear, Ltd., Buttrey, R. W., and Ciborowski, B. C.—High voltage switchgear. 25th September, 1957. (834035.)

General Electric Co.-Electric 30301.

30403. Rank Cintel, Ltd.—Signal gating circuits. 4th October, 1957. (833762.)
30436. General Electric Co.—Valve circuits for pulse shaping. 5th October, 1956. (833763.)

31464. Philips Electrical Industries, Ltd.— Frequency modulation circuit arrangements. 16th October, 1956. (833766.)

34895. Corson, Inc., G. & W. H.—Electric current producing cell and method of generating current with same. 14th November, 1956. (834122.)

35626. British Telecommunications Research, Ltd.—Electrical connecting arrangements. 18th November, 1957. (833516.)

36561. General Electric Co.—Semiconductor materials. 29th November, 1956. (833774.)

37181. Philips Electrical Industries, Ltd.-Transistors. 5th December, 1956. (833775.)

General Electric Co.-Electrical control circuit arrangements, 27th December, 1956. (833686.)

39447. Standard Telephones & Cables,

39447. Standard Telephones & Lauce, Ltd.—Interdigital delay line for travelling wave tubes. 28th December, 1956. (833687.)

39480. General Electric Co.—Electrical contact rectifiers. 28th December, 1956. (833688.)

37. Submarine Cables, Ltd.—Means for handling hawsers, cables and the like and sheaves for use in connection therewith. 23rd December, 1957. (833689.)

4125. General Electric Co., Ltd.—Thermo-electric devices for measuring thermal radiation. 6th February, 1958. (834134.) 4126. Pyrometric apparatus. 6th February, 1958. (834135.)

4765. Western Electric Co., Inc.—Connections to semiconductor bodies. 12th February, 1957. (834289.)

4941. Compagnie Française Thomson-Houston.—Electronic oscillators. 13th February, 1957. (833703.)

Tate Bros., Ltd., and Tate, A. E .-

Connectors for electric power cables. 14th February, 1958. (833480.)

5301. Tate Bros., Ltd., and Tate, J. E.—Connectors for the ends of power cables. 13th February, 1958. (833528.)

Sperry Rand Corporation.-Frequency comparison means, 26th February, 1957. (833708.)

7379. Etablissements L. Faiveley.—Current collecting device. 6th March, 1957. (Addition to 805084.) (834295.)

8606. Cator, W. S.—Electric multi-contact plug and socket couplings. 13th June, 1958. (Addition to 779946.) (834139.)

8979. Mullard, Ltd.—Systems for detecting relative movements using ferro-resonant systems. 11th February, 1958. (833712.)

British Thomson-Houston Co., Ltd. Electrical switches or circuit-breaker. 5th February, 1958. (834140.)

J. F.—Melting of solidified materials by high frequency electric heating. 25th June, 1958. (833714.)

[Continued on page 991

# Electrical accessories from the



range





## "TAY" flush plate/switches and bell pushes

- All insulated. Current carrying parts mounted on high-grade vitreous porcelain.
- Solid Silver contacts.
- Modern styling eliminates dust traps.
- Plate and switch form a onepiece unit, self adjusting to varying plaster levels.
- Brown or ivory finish.







724 TFB



71 TFB

723 TFB



# "TAY" plaster depth boxes

- Wood, moulded and steel.
- Steel boxes available with insulated lugs adjustable for alignment.
- A range of steel boxes available with special clamps for M.I.C.C. cables.











The full range is detailed in the new 88-page catalogue. Write for your copy today, list No. 435 R

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM 11

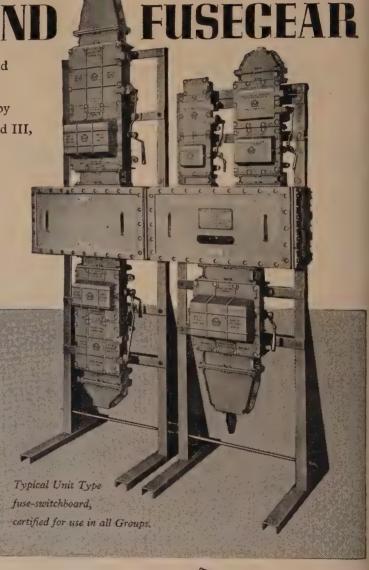


#### **FLAMEPROOF**

SWITCH AN

A complete range of combined switch and fuse units up to 150 amp. sizes is now available, approved, tested and certified by the Ministry of Power in Groups I, II and III, incorporating throughout Aeroflex High Breaking Capacity rewireable cartridge fuse-links.





List FPI featuring Aeroflex-Fluvent flameproof switch and fusegear will be forwarded on request





# Parmiter Hope & Sugden Ltd.

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

London: 34 Victoria Street, S.W.1.

Glasgow: 5 Somerset Place, C.3.

Birmingham: 39/41 Carrs Lane, 4

#### NEW PATENTS [continued]

British Thomson-Houston Co., Ltd.—Electrical winding and haulage equipment. 28th March, 1958. (833532.)

11990. Holding Electrosonic S.A.—Wobbulator devices. 12th April, 1957. (834301.)

12442. Klemp, G.—Electric heating stove. 16th April, 1957. (833784.)
13247. Wolf Electric Tools, Ltd.—Electric motors. 25th April, 1958. (834044.)

13944. Telefonaktiebolaget L. M. Ericsson.—Cross bar switches for automatic telephone systems. 1st May, 1957. (833722.)

14955. British Insulated Callender's Construction Co., Ltd.—Joints and terminations of electric cables. 9th May, 1958. (833787.)

I-T-E Circuit-Breaker Co.— transformer, 21st May, 1957. 16133. Current (833790.)

16402. Sperry Gyroscope Co., Ltd.-Potentiometer. 12th September, 195 1958. (833792.)

18815. Librascope, Inc.—Switch arrangement for magnetic transducer selection. 14th June, 1957. (833545.)

10128 English Electric Ltd.-Liquid cooled apparatus. 18th June, 1958. (834056.)

Siemens Edison Swan, Lighting fittings. 15th May, 1958. (833735.) 19624. Burndept, Ltd.—Manufacture of dry batteries. 22nd September, 1958.

(834058.) 20169. Pullin & Co., Ltd., R. B.—Electrical stethoscopes. 7th May, 1958. (833737.)

21012. Marconi's Wireless Telegraph Co., Ltd.—Frequency modulated piezo-electric crystal circuit arrangements. 1st April, 1958. (833740.)

22327. Marconi's Wireless Telegraph Co., Ltd.—Automatic frequency control systems for oscillators. 3rd April, 1958. (833881.) 22804. Telefonaktiebolaget L. M. Erics-son.—Connecting means for local inquiry calls in automatic telephone exchanges. 18th July, 1957. (834203.)

23623. British Thomson-Houston Co., Ltd.—Dynamic braking of induction motors. 18th July, 1958. (834330.) 24412. Telephone Manufacturing Co.,

24412. Telephone Manufacturing Co., Ltd.—Electrical circuits. 28th July, 1958.

(833885.) 24504. Sourgens, R., and Chollet, R.— Electronic teleprinter. 2nd August, 1957.

(833811.) 24586: Standard Telephones & Cables, Ltd.—Piezo-electric crystals, 1st August, 1958. (834333.)

25936. British Thomson-Houston Co., ed.—T.R. devices. 15th August, 1958. (833886.)

28397. Painton & Co., Ltd.—Method of manufacturing electrical resistors. 9th December, 1958. (834072.)

28697. Plessey Co., Ltd.—Heat resistant dielectrics. 1st September, 1958. (834076.)

28961. Pye, Ltd.—Rotary electric switches. 15th September, 1958. (833890.)

29026. Union Carbide Corporation.— Electric battery lamp switch incorporating a magnet. 16th September, 1957. (834081.)

29499. Apra Precipitator Corporation.— Purging continuously energised electrostatic precipitator. 19th September, 1957. (834084.)

29716. British Insulated Callender's Cables, Ltd.—Strain insulators. 19th September, 1958. (834085.)

29773. Libbey-Owens-Ford Glass Co.— Electrically conducting glass units. 23rd September, 1957. (833891.)

29835. General Electric Co., Ltd.—Electric incandescent filament lamps. 23rd September, 1958. (834087.)

30711. Allday & Son (1922), Ltd., H.—Electric earthing clips. 9th September, 1958. (834091.)

31016. General Electric Co., Ltd., and Milner, P. W.—Arrangements for measuring the frequency of an alternating electric current. 1st October, 1958. (833893.)

31164. Standard Telephones & Cables, Ltd.—Selenium rectifier. 4th October, 1957. (833894.)

Brentford Transformers, Ltd.-31316. Contact devices for movement along a current carrying coil. 17th September, 1958. (834349.) 31418. Saxony Electronics, Inc.—Portable dryers. 8th October, 1957. (834092.)

31599. Sylvania-Thorn Colour Television Laboratories, Ltd.—Electric power convertors. 11th September, 1958. (833896.) 31652. Brinro, Ltd.—Infra-red ray detecting apparatus. 10th October, 1957. (Addition to 785340.) (833897.)

32577. Electro-Static Air Filter Mfg. Corporation.—Electrostatic gas filter. 18th

October, 1957. (834096.) 32774. Zogmal, R. P.—Devices for pre-enting the unauthorised use of low current

apparatus. 21st October, 1957. (834098.)
32933. Widakowich, M.—Transistor in-

vertors for use with fluorescent tubes. 22nd October, 1957. (834099.)

34194. Ford Motor Co., Ltd.—Electrical gulator devices. 1st November, 1957. (834103.)

34760. Onofri, G., and others, trading as Onofri, F. (Firm of).—Electric hotplate for

cooking appliances and the like and a method manufacture. 7th November, 1957. (834106.)

I-T-E Circuit-Breaker Co .-- Re-36032. irculating gas blast circuit interruptor. 19th November, 1957. (833559.)

36544. Messen-Jaschin, G. (trading as Messen-Jaschin, G. A.).—Apparatus for dissipating electrostatic charges. 22nd November, 1957. (834113.)

39154. Trüb, Täuber & Co. A.G.—Magnetic field stabiliser. 17th December, 1957. (834119.)

39214. Telefonaktiebolaget L. M. Ericsson.—Arrangement for effecting a selective connection between a pair of lines. 17th December, 1957. (833933.)
39548. Siemens & Halske A.G.—Polarised

Joseph S. Haiske A.C.—Polarised electromagnetic changeover relays. 19th December, 1957. (834142.)

39661. Philips Electrical Industries, Ltd.

—Devices for making announcements in vehicles. 20th December, 1957. (833935.)

1020. Ismay Lamps, Ltd.—Apparatus for testing and conveying electric lamps. 10th January, 1958. (Addition to 744017.) (834150.)

#### *NEXT WEEK'S EVENTS*

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.I, to ascertain that proposed dates for their functions do not clash with others already arranged

#### MONDAY, 23rd MAY

London.—John Adam Street, Adelphi, W.C.2, 6 p.m. Royal Society of Arts. Third Cantor Lecture on "Energy." "The Retail Distribution of Electricity," by C. Robertson

At the Institution of Civil Engineers, Great At the Institution of Civil Engineers, Great George Street, S.W.1, 5-30 p.m. Institute of Fuel. "Recommendations on Heights for New Industrial Chimneys," by G. Nonhebel. Watford.—Compass Hotel, 8.15 p.m. A.S.E.E. North West London Branch. "Impact of the N.I.C.E.I.C.", by E. J. Sutton.

#### MONDAY, 23rd MAY to SATURDAY, 28th

London.—Olympia. International Instruments, Electronics and Automation Exhibition.

#### TUESDAY, 24th MAY

Broadstairs.—Clarendon Hotel, 8 p.m. A.S.E.E. East Kent Branch. "Earth Leakage Protection of Domestic and Similar Installa-

Protection of Domestic and Similar Installations," by J. A. Robbins.

Cardiff.—At the South Wales Engineers' Institute, Park Place, 7.30 p.m. Institution of Plant Engineers, South Wales Branch. "Controlled Maintenance," by G. E. Halter.

Dundee.—Royal Hotel, 5, Union Street.
Combustion Engineering Association, Scottish Branch. 10 a.m. Discussion on "Clean Air and Industry." 2 p.m. Discussion on "Water Treatment for Industrial Boiler Plant," opened by D. S. Kerr.

London.—26, Portland Place, W.I. Society of Instrument Technology London Meeting. 6 p.m. Annual general meeting, followed at 7 p.m. by the presidential address, by R. S. Medlock.

Medlock

21, Bloomsbury Street, W.C.I, 11.30 a.m. Society of Relay Engineers. Annual general meeting, followed (at 2.30 p.m.) by "The Influence of Cable Characteristics on the Design and Performance of Television Relay Systems," by P. Bass.

Newcastle-upon-Tyne. — Crown Hotel, Clayton Street, 7.30 p.m. A.S.E.E. New-castle-upon-Tyne and District Branch. Annual general meeting.

#### WEDNESDAY, 25th MAY

Birmingham,—Birmingham Electric Club. isit to South Wales Switchgear Co., Ltd.,

Blackwood and Aberbargoed.

London.—Savoy Place, W.C.2, 5.30 p.m.
I.E.E. Electronics and Communications
Section. Discussion on "New Semiconductor

Devices and their possible Application," opened by Dr. A. F. Gibson and G. King.
21, Albemarle Street, W.1, 9 p.m. Royal Institution of Great Britain. "Luminescence—The Cold Light of Physics," by Dr. G. F. J.

Garlick.

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.I, 6.30 p.m. British Institution of Radio Engineers. Symposium on "Techniques of Frequency Synthesis."

Savoy Hotel, W.C.2. British Institute of Management. Conference on "Management Consultants in Industry and Commerce."

Royal Albert Hall, 7.30 p.m. National final of E.D.A. Electricity Quiz Competition.

Manchester.—Engineers' Club, Albert Square. British Lighting Council, North West Region, 2.30 p.m. Conference on Highway Lighting.

Wolverhampton.—Chamber of Commerce,
Wolverhampton.—Chamber of Commerce,
District Bank Chambers, Lichfield Street, 7
p.m. A.S.E.E. Wolverhampton and District
Appual general meeting.

#### THURSDAY, 26th MAY

Croydon.—Greyhound Hotel, High Street, 15 p.m. A.S.E.E. South London Branch.

Croydon.—Greynous.

7.15 p.m. A.S.E.E. South London Branch.
Annual general meeting.

Dundee.—Queen's College, 7 p.m. I.E.E.
Scottish Centre. Annual general meeting.

Hove.—New Imperial Hotel, 1st Avenue,
7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Variable Speed A.C. Motors."

Liverpool.—Exchange Hotel, 7.15 p.m.
Institution of Plant Engineers, Merseyside
and North Wales Branch. "Packaging and
Container Engineering," by E. Evans.

London.—Connaught Rooms, W.C.2, 12.30
for 12.55 p.m. Batti-Wallahs' Society.

Southampton.—Polygon Hotel, 8 p.m. A.S.E.B. Southampton Branch. "Electricity as Supplied to the Printing Trade," by S. C.

#### FRIDAY, 27th MAY

Liverpool. — M.A.N.W.E.B., Paradise Street, 6.30 p.m. A.S.E.E. Liverpool and District Branch. Annual general meeting.

South Farnborough.—Queen's Hotel, 7.30 p.m. A.S.E.E. Aldershot and Districts Branch. Annual general meeting.

#### SATURDAY, 28th MAY

Manchester.—A.S.E.E. Manchester Branch. A trip on inland waterways.

#### CONTRACT INFORMATION

#### Accepted Tenders and Prospective Electrical Work

#### CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Birmingham.—Corporation. 1st June. Electrical installation and oil-fired heating installation at the Industrial Research Laboratories. (See this issue.)

Burma.—Union of Burma Purchase Board, Rangoon. 2nd June. 12 V and 6 V batteries. (E.S.B. 12932/60.)\*

Ceylon.—Tender Board, Ministry of Transport and Power. 22nd June. Overhead line accessories. (E.S.B. 12479/60.)\*

Chesham.—U.D.C. 11th June. Group "A" street lighting equipment. (See this

issue.)

Costa Rica.—La Proveeduria Nacional, San Jose. 1st June. Multibreaker boxes and circuit-breakers. (E.S.B. 12094/60.)\* Electric cable and wire. (E.S.B. 12093/60.)\*

Egypt.—Cairo Electric Railways. 1st Sep-ember. Electric cars (Metro). (E.S.B. tember. E 12453/60.)\*

Formosa.—Central Trust of China, Taipei. 31st May. Relays. (E.S.B. 12688/60.)\* 6th June. Distribution transformers, ranging from 5 kVA to 50 kVA, and pole type regulators. (E.S.B. 12668/60/I.C.A.)\* Control panels. (E.S.B. 12667/60/I.C.A.)\* 10th June. Potential, current and instrument transformers. (E.S.B. 12669/60/I.C.A.)\* 14th June. Relay protective equipment and auxiliaries. (E.S.B. 12666/60/I.C.A.)\* 15th June. 10 kW rheostat. (E.S.B. 12661/60/I.C.A.)\* 29th June. Telephone equipment. (E.S.B. 12664/60/I.C.A.)\*

Greece.—State Procurement Service,

Greece.—State Procurement Service, Athens. 27th May. Magnet wires. (E.S.B. 12455/60.)\*

12455/60.)\*
India.—Government Iron and Steel Controller, Calcutta. 23rd June. Electric steel sheets, M.S. electrode core wire and electrolytic tinplate. (E.S.B. 12443/60/D.L.F.)\*
Singareni Collieries Co., Ltd., Hyderabad. 30th June. H.v. cables. (E.S.B. 12632/60.)\*
Rajasthan State Electricity Board, Jaipur, 3rd June. 70,000 l.v. insulators. (E.S.B. 12942/60.)\*
10th June. Transformers ranging from 50 kVA to 1,000 kVA. (E.S.B. 12943/60.)\*

Kuwait.—Department of Electricity, Water and Gas. 12th June. Substation distribution boards. (E.S.B. 12923/60.)\*

Liverpool.—City Council. 7th June. Supply and erection of a passenger lift at West-minster House. City engineer, Municipal

22nd June. L.v. switchboards. (See this issue.) Nigeria.—Electricity Corporation of Nigeria.

Rothwell.—U.D.C. 3rd June. Group "B" street lighting equipment. (See this issue.)

South Africa.—Stores Department, South African Railways, Johannesburg. 27th May. Two electrically-heated bogie hearth furnaces, one spare, and one electrically operated traverser. (E.S.B. 12475/60.)\*

Southend-on-Sea.—Corporation. 3rd June. ectrical installation at Wentworth High Electrical installation at School. (See this issue.)

Sudan.-Sudan Railways Stores Department, Atbara. 14th June. A.c. motors.

\* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

(E.S.B. 12439/60.)\* 20th June. Submarine cable. (E.S.B. 12440/60.)\*

Controller of Stores, Ministry of Works, Khartoum. 13th June. 500 ceiling fans. (E.S.B. 12631/60.)\*

Thailand. — Metropolitan Electr Authority, Bangkok. 9th June. Insule electric wire. (E.S.B. 12612/60/L.D.F.)\* Electricity Insulated

#### ORDERS PLACED

Blackpool.—Corporation Education Committee. Re-lighting of Claremont Secondary Schools (£3,336).—R. A. Ranson. Re-lighting of Collegiate School (£3,313).—S. B. Wilding

Glasgow.—British Railways, Scottish Region. Two 10-ton diesel-electric rail travelling cranes.—Taylor & Hubbard.

Lancashire.—County Council Education Committee. Rewiring of electrical installation in Tyldesley Technical School (£1,677).— G. Moss & Sons.

London.—L.C.C. Electrical installations in blocks 1, 2 and 3, Alpha Square, Southwark (£5,788).—Samuel Reed & Sons. Electric water heaters, St. Helier estate, Surrey (£5,653).—F. J. Baynes & Co.

Ossett.—Corporation. Street lighting programme for the year 1960-61 (£5,817).—Engineering & Lighting Equipment Co.

Surrey.—County Council. Electrical services at Kingston Technical College (£26,431).-Alpha Manufacturing & Electrical Co.

Wolverhampton.—Corporation. Recommended. Electrical installations in dwellings, Vauxhalls re-development scheme (£27,517).
—Midlands Electricity Board.

#### **WORK IN PROSPECT**

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Arbroath.—Bank and offices, Brothock Bridge (£70,000); National Commercial Bank of Scotland, 42, St. Andrew's Square, Edin-

Aylesbury. — Police headquarters (£160,000); H. J. & A. Wright, Ltd., Great Missenden, Bucks.

Birmingham.—Works extensions, Minworth; Birmingham and Rea District Drainage Board, Lombard House, Great Charles Street.

Works and offices, Steelhouse Lane; Birmingham Post & Mail, Ltd., Cannon

Blackburn.--Extension to Royal Infirmary (£500,000); Bradshaw, Gass & Hope, architects, 19, Silverwell Street, Bolton.

Brackley.—Houses (50), Beaumont Crescent; borough surveyor, 18, Market Place, Brackley, Northants.

Brentwood (Essex).—Flats and houses (80), Hutton estate; surveyor, Urban Council Offices, Ingrave Road.

Crawley.—Council offices (£276,000); Sir John Brown and A. E. Henson & Partners, architects, 117, Sloane Street, London, S.W.1.

Crewe.—Extension to County Teachers' Training College (£155,000); A. V. Shenton, Ltd., Pitsford Road, Normacot, Longton, Stoke-on-Trent.

Croydon.—Public halls, Park Lane; R. Atkinson & Partners, architects, 13, Manchester Square, London, W.1.

Denton.—Houses (60), Dark Lane F site; J. Smith, clerk to U.D.C., Town Hall. Lane Farm

Dundee.—Houses (330), Midmill project; R. Dron, city architect, 17, City Square.

Eastbourne.—Houses (44), Spots Farm and Langley; borough engineer, 2/4, Saffrons Road.

Edinburgh.—New isolation unit at Elsie Inglis Hospital; Southern Hospitals Board of Management, 21, Hill Street, Edinburgh.

Ellesmere Port.—Houses (43), North Whitby estate, and three-storey flats, Church Street/Queen Street site; borough engineer,

Epping.—Children's home, Coppersale; Essex county architect, County Hall, Chelmsford.

Exmouth.—Extension of Dotton water-works pumping station; G. H. Hill & Sons, consulting engineers, 51, Mosley Street, Man-

Gloucester.—Civic centre; city engineer, 21, Eastgate Street.

Harrow.—Extensions to Whitefriars Secondary School (£80,221); Middlesex county architect, 1, Queen Anne's Gate Buildings, London, S.W.1.

Ipswich.—Extensions to County Hall; E. Cundliffe, county architect, County Hall, E. J. Ipswich.

Lichfield.—Houses (80), Oakdene estate, Burntwood; surveyor, Rural Council House.

Liverpool.—Eleven-storey blocks of flats on various sites; director of housing, Blackburn Chambers, Dale Street, Kingsway,

London.—Four-storey block of flats and supermarket, King's Road; Stone, Toms & Partners, architects, 28, South Audley Street, London, W.1.

Twenty-seven storey hotel, Park Lane; oken Construction Co., Ltd., 68, Mount Token Con Street, W.1.

Street, W.I.
Shops and offices, Langham Place, Mary-lebone; John Laing & Son, Ltd., Page Street,

Factory block, Southwark; James Clark &

Eaton, Ltd., Great Suffolk Street, S.E.I.
Flats (21), Southcroft Road, Tooting;
J. Hewitt Mitchell, architect, 140, Streatham Hill, S.W.2.

Manchester.—Houses (244) and flats (129), Cheetham; Bentley Building Co., Ltd., Union Street, Oldham.

Margate.—Maternity unit, General Hospital; Adams, Holden & Pearson, architects, 38, Gordon Square, London, W.C.1.

Milnrow.—Works extensions for John Holroyd & Co.; James Berry, Ltd., Chapel Street, Heywood.

Rhyl.—Hotel, West Parade and Quay Street; Richard & Douglas Hall, architects, Bowdler's House, Town Walls, Shrewsbury.

St. Albans.—Extensions to Museum, Michael's Street; city engineer, 16, St. Peter's

Salford.—Halls of residence for Royal Technical College; T. Mellor, architect, Old Market Hall, Lytham St. Annes.

Seaton Valley.—Houses (48), Cramlington; H. Brummitt, clerk, Council Offices, Seaton Delaval, Whitley Bay.

Shrewsbury.—Departmental stores, Castle Street; H. Winbourne, chief architect to F. W. Woolworth & Co., Ltd., Woolworth House, Marylebone Road, London, N.W.

Sunderland.—Five-storey shop premises, Fawcett Street, for Binns, Ltd.; Gordon Jeeves, architect, 61, Catherine Place, London, S.W.I.

Maternity clinic, Hylton Castle estate, mental health training centre, Plains Farm estate, and 15 flats, Mowbray Road; H. C. Rishap, horough architect.

estate, and 15 flats, Mowbray Road; H. C. Bishop, borough architect.
Factory extensions (£14,000), Villiers Street, for Ditchburns, Ltd.; Newrick & Blackbell, architects, 58, John Street.
Houses (24), near Tunstall Road, for Major A. A. M. Gregson; George T. Brown & Son, architects, 14, Grange Terrace.

**EMERGENCY LIGHTING**—The new cells have been designed for uses where stand-by electrical power is required. By their very nature they are especially suited to emergency lighting in power stations, sub-stations, theatres, concert halls, hospitals, factories and public buildings of all sorts.



# All the power in half the space

# New Pritchett & Gold High Performance Cells

The exceptional performance of these cells is the result of more than three-quarters of a century of experience in the design and manufacture of stationary batteries. The new cells have been designed for duties where stand-by electrical power is needed and save up to half the space previously required.

#### SWITCHGEAR OPERATION

On high rate duties, such as switch closing, these new Pritchett & Gold High Performance cells are capable of a current output almost twice that of the B.S. design of the same nominal capacity.

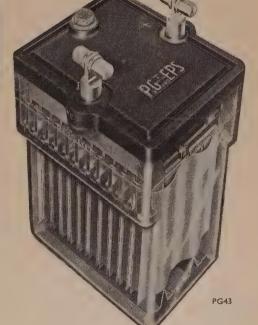




operation for which these new Pritchett & Gold cells are eminently suited. Their small bulk and high output makes storage a simple matter in contrast with older designs.



TELECOMMUNICATIONS
too, are safeguarded when the
new cells are available to
guarantee stand-by power in
emergency. They are ideal
for either trickle-charge or
floating conditions of operation.



**DIESEL ENGINE STARTING** These cells are now being used for starting stationary diesel engines which provide emergency power supplies in cases of mains failure.

# PRITCHETT & GOLD AND E.P.S. CO. LTD

Makers of Dagenite Batteries

137 VICTORIA STREET · LONDON · SWI

PHONE: TATE GALLERY 9212



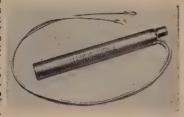
# WHEN YOU'VE LOOKED AROUND

You'll put in . . .

Pullin precision thermostats—a brand new range of controls for heating and cooling, specially designed by the makers of the now famous 'PULLIN PLUG-STAT' in co-operation with an internationally established designer.

# PULLIN, THERMOSTATS

Most Recent Addition to this impressive range is the L4 Floor Limit Thermostat, specially developed as an accurate temperature limiting device for under-floor heating installations. It is specifically designed to control the surface temperature of the floor to within an accuracy of plus or minus one degree.



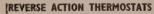
Floor Limit Thermostat (L4)—it is cylindrically shaped so that it can be easily positioned in a conduit on a plane with under-floor heating elements. It is provided with two leads with a choice of length and accurately controls the flow of current to the heating elements when connected in series in conjunction with the Pullin A2 Room Thermostat. The L4 is sealed against dust and moisture, and once set and installed, it requires no further attention.

Already widely acclaimed are the A2 Room Thermostats, for heating or cooling control, attractively styled in tough grey plastic finish with a temperature range of from 30°-90°F. (or Centigrade equivalents). Available with or without an intermittent Neon Indicator Light, Control Lock or "OFF/AUTO" Switch. Rated at 0-250 v. 20 amps. A.C. non-inductive, 5 amps. A.C. at 0.7 P.F., or 0.5 amps. D.C.



#### ROOM THERMOSTATS

Two models available, the A2/W and A2/WNL. Precision built to critical specifications and designed to control electric underfloor heating, storage heaters, tubular heaters, warm air systems, etc.



The two models A2/RA and A2/RANL have a proven record after extensive testing. Designed to meet the demand for cooling applications in industry and agriculture, they are accurate to the finest limits.



#### Think of Precision Thermostats — Think of R. B. Pullin

Write for technical leaflets to:

R. B. PULLIN & COMPANY LIMITED, THERMOSTAT DIVISION PHOENIX WORKS, GT. WEST ROAD, BRENTFORD, MIDDLESEX Tel.: ISLeworth 1212 Cables: Pullinco Wesphone London

# NAME PLATES NAME PLATES NAME PLATES



AND ALL TYPES OF ENGRAVING

# THEW

OF GATESHEAD ON TYNE

SPECIALISTS IN NAMEPLATES FOR THE ENGINEERING AND ELECTRICAL TRADES

EDWARD H. THEW LTD., I FIRST AVENUE, TEAM VALLEY TRADING ESTATE, GATESHEAD ON TYNE II

1778

# Now made in Great Britain-

# DEAC

PERMA-SEAL

# SEALED RECHARGEABLE NICKEL CADMIUM CELLS & BATTERIES





For Radios, Hearing-Aids, Tape Recorders, Shavers, Photo Flash Equipment, Torches, Electric Toys, Portable Measuring Instruments.

- \* No corrosion \* No gassing
- \* No maintenance
- \* Unlimited shelf life
- \* Robust and compact
- \* From 20 mAh to 23 Ah

All enquiries to the Sole Distributors

#### G. A. STANLEY PALMER LIMITED

Maxwell House, Arundel Street, London W.C.2. Phone: TEMple Bar 3721

MANUFACTURED IN GREAT BRITAIN BY DEAC (GREAT BRITAIN) LTD. Altona Way, Buckingham Avenue, Trading Estate, Slough, Bucks. Slough 24539



# Are you complying with the REVISED FACTORY REGULATIONS?

Revised regulations regarding First Aid in Factories are effective from 1st January 1960.

As the Pioneers of Industrial First Aid we offer approved complete First Aid Outfits to meet the requirements of all trades.

Please state number of employees and nature of business when ordering.

Full details are available to responsible officials applying on their company's letterhead, mentioning this "Electrical Review" announcement.

#### CUXSON, GERRARD & CO. LTD. **OLDBURY, BIRMINGHAM**

Telephone: BROADWELL 1355 (4 lines)



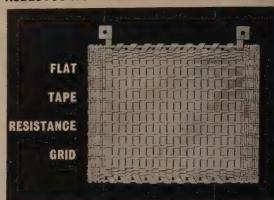
Manufactured by

#### ASQUITH ELECTRICS (Colne) LTD.

formerly Colne Switchgear (K. & W.) Ltd. Walton Street, Colne, Lancs. Telephone: Colne 139415

Cressall

#### ASBESTOS WOVEN RESISTOR GRIDS AND NETS



light and rigid . . . ideal for bank assembly

These light, flat resistors are textile weavings impregnated to give rigidity-the warp threads being of asbestos, and the weft of resistance wire (for nets) or resistance tape (for grids). They require only the simplest of supports for assembly into banks, and give trouble-free service at working temperature up to 300°C.

- Vibration and shock-proof
- Low self-inductance and self-capacity
- Suitable for all Q.C. and most A.C. applications.
- Many standard units for quick delivery—also made to . specification



The CRESSALL MANUFACTURING CO. LTD, A subsidiary of The Expanded Metal Co. Ltd.

Eclipse Works, Tower St., Birmingham 19 Tel: Aston Cross 2666 Grams: 'OHMIC' B'HAM London Office: 16 Caxton St., London, S.W. | Tel: ABBey 7766 | Telex: 23392

# COIL WINDINGS

SOUTHERN TRADE SERVICES LTD Southbridge Rd., Croydon Tel. 2727/8





We also manufacture CABLE GLANDS and PORTABLE VICES

PLANT ENGINEERING CO. LTD. 90-91 COX STREET WEST, BIRMINGHAM 12

Telephone: CALthorpe 1551-2



the

name

behind

the

driving

power

of

industry

Here is the Squirrel Cage Motor with staying power, built for a lifetime of service. It is immediately available from stock in outputs up to 25h.p. Standard dimensions to B.S.2083 (1956). Full details are given in Technical Description No. 431.

THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND HEAD OFFICE MAGNET HOUSE KINGSWAY LONDON WC2



# gives these reliability

Quality Control at GKN means much more than inspection of the finished product: it means that minute inspection at every stage of production ensures that each process is faultlessly carried out. Quality Control begins with the raw material

and ends only with the severest tests on the finished article. Since its adoption by GKN over 20 years ago, it has become the most important single contributory factor to the superb quality implied in the initials GKN.



GUEST KEEN & NETTLEFOLDS (MIDLANDS) LTD.,



#### Carlona Polyethylene for cables and casings

of modern plastics, and one of considerable interest to the electrical industry. In addition to its toughness, rigidity, resistance to impact, abrasion, corrosion and heat — all first-rate — its excellent stress-cracking properties make it an ideal material for cable insulation and similar work. CARLONA is available in a number of grades and in a wide range of colours.



Further details may be obtained from Shell Chemical Company Limited, 170 Piccadilly, London, W.1. Regional Offices at London, Birmingham, Manchester, Glasgow, Belfast and Dublin.

Overseas enquiries should be directed to your Shell Company (or to Shell International Chemical Company Limited, St. Swithin's House, St. Swithin's Lane, London, E.C.4.) 
'SHELL' and 'CARLONA' are registered trade marks.

Shell Plastics mean brighter prospects

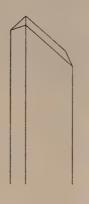


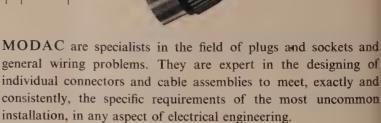
# Make contact with Modac



## Modac Connectors

Wiring & Connectors Division The Plessey Company Limited





That is not to say, however, that Modac are unable to supply, from stock, a fully comprehensive range of connectors—from heavy duty to miniature—for use over the same broad field of application from transport to telecommunications, from nucleonics to electronics.

But whether 'off the shelf' or tailored to a customer's requirements, Modac connectors, featuring independently sprung, multi-point contacts and bevelled blades, not only minimise the effects of vibration and give low contact resistance, but are also self-cleaning. They ensure, in fact, that a Modac connection is the best that can be made — in any installation.

CHENEY MANOR · SWINDON · WILTS · Telephone: Swindon 6251

# SMOOTH PASSAGE

—but when it's a question of passing current from one point to another, whether in general purpose wiring, low tension power distribution or special industrial applications, Mersey Cables are called for.

As the cable manufacturing Company in the Electrical Division of the Tube Investments Group, Mersey have acquired long experience and incomparable skills. Their wide range embraces many advanced types including shaped conductor plastic insulated mains cables and solid conductor wiring cables. PVC general purpose cables are now being made to the new BS2004 and these, like Mersey's range of communications cables, embody the highest standards of reliability; furthermore, the latest and most efficient methods of production enable them all to be produced at economical cost.

Whatever your particular requirement, specify MERSEY, the first choice of practised cable users.

#### cable information



is a handbook recently produced by Mersey Cable Works and is devoted entirely to data concerning cables, their functions and applications. This invaluable and comprehensive guide to the most efficient use of cables is readily supplied on request.

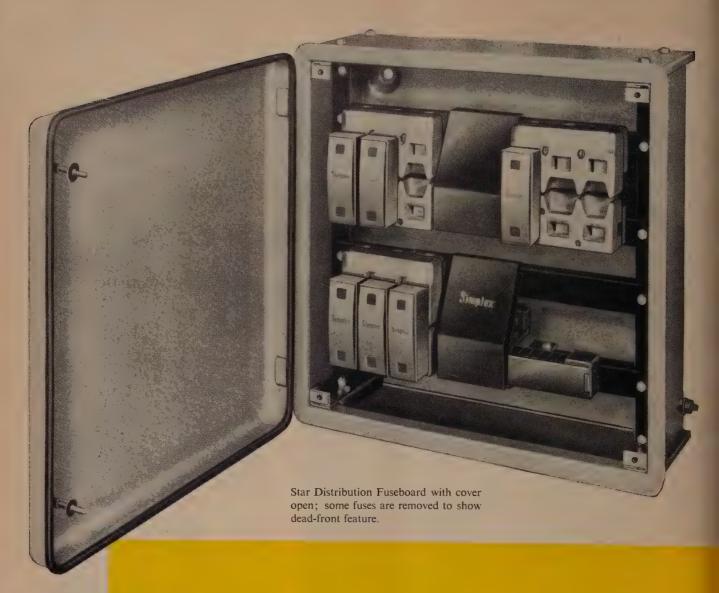
MERSEY



Mersey Cable Works Limited

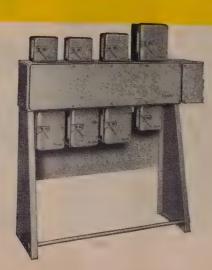
Liverpool 20 Telephone: Bootle 4111





# Simplex





Star Switchboard — a team of Simplex practical experts will help you with designing, building and advice on complete Simplex switchboard installations. Also available with Simplex S & S automatic control gear, fused switches, isolators, etc.

SIMPLEX ELECTRIC COMPANY LIMITED
BLYTHE BRIDGE • Nr. STOKE • ON - TRENT • STAFFS

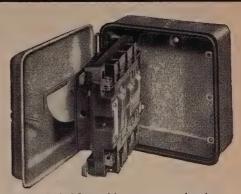
A 1 COMPANY

Branches throughout Gt. Britain and agents throughout the world.

Simplex Star "dead-front" Distribution Fuseboards are low in price, easy to wire, and completely safebecause all live parts are shrouded, even with the fuses removed. There is provision for circuit identification on the fuse bank and neutral connections, for surface or flush mounting, and they are available in 15, 30 or 60 amp fuse ratings, 500 volt A.C. or 250 volt D.C. Write to your nearest Simplex Branch for of Simplex Star your copy the Catalogue, giving full details of the Star and Star Economy Fuseboards.



# Star



Star Switchfuse with cover open showing interior hinged forward for ease of wiring. Range: AC 500 volt, 15, 30, 60 amp. DC 250 volt, 10, 20, 30 amp.

SIMPLEX STAR DISTRIBUTION BOARDS FROM THE BRILLIANT NEW RANGE OF DEAD-FRONT SWITCHGEAR WITH EVERYTHING PLUS BUT THE PRICE

# WRIGHT" Model 58/ES Coated Abrasive Disc-Type



#### FINISHER SURFACE

for Grinding, Polishing and Sanding

Indispensable for finishing operations in the Metal-Working, Plastic and Woodworking Industries, and in particular for linishing and polishing of small components and for the sanding and polishing of samples for Microscopic Checks and Micrographs.

- ★ Location of Abrasive Disc by suction
- **★** Two speed 1,440/720 r.p.m. pole-change motor drive
- ★ Simple to operate Speedy change of disc

#### WRIGHT ELECTRIC MOTORS (HALIFAX) LTD.

Manufacturing Electrical and Mechanical Engineers

Phone: Halifax 60201-2-3 HALIFAX Grams: MOTOR, Halifax

ESTABLISHED 1900



## INSULATINGP

When you specify a paper you don't expect 'ifs' or 'buts'... you expect to get what you want. So make sure your papers come from Tullis Russell-and save your energy for sorting out any snags elsewhere! Tullis Russell papers range from those for fine-wire winding to body material for heavy bonded bushings. Please don't hesitate to call in our Technical Advisory serviceeven when your problem's a trifling onel We're always glad to be of service.

# Tullis Russe

150 YEARS OF FINE PAPERMAKING

SCOTLAND: Auchmuty & Rothes Paper Mills, Markinch, Fife

LONDON: Ivorex House, Upper Thames St., London, E.C.4

BIRMINGHAM: Griffin House, 18-19 Ludgate Hill

MANCHESTER: 372 Corn Exchange Buildings, Corporation St. WPS-117



for all
INDUSTRIAL
PURPOSES

A.C. MOTOR STARTING



NEON & FLUORESCENT LIGHTING

CAR AND AERO IGNITION
INTERFERENCE
SUPPRESSION

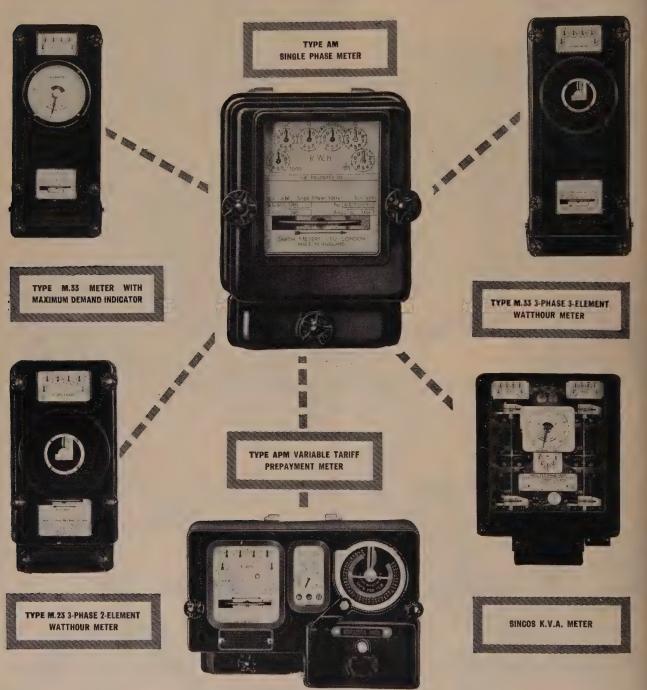
CONDENSER
SPECIALISTS
FOR
OVER 50
YEARS

TOC

THE TELEGRAPH CONDENSER CO. LTD

INDUSTRIAL DIVISION · NORTH ACTON · LONDON W.3 · Telephone: ACOrn 006i

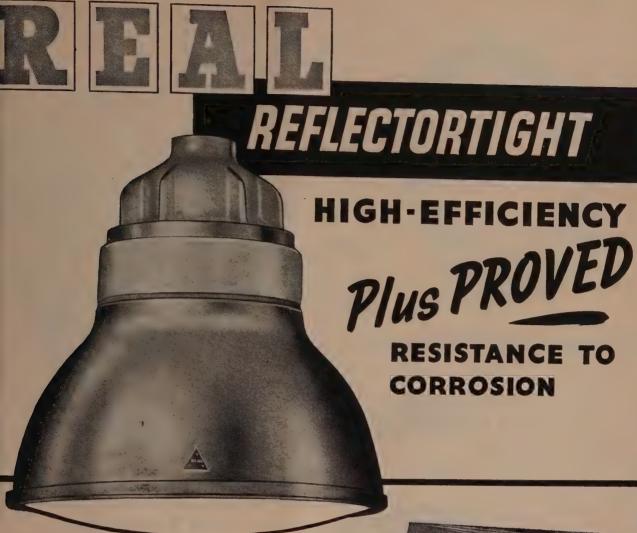
# Smith House Service Meters ensure quality control





# **Smith Meters Limited**

ROWAN ROAD · STREATHAM VALE · LONDON · S.W.16 · TELEPHONE: POLLARDS 2271



#### REFLECTORTIGHT HISTORY

A factual Progress Report of performance under truly heavy-duty conditions.

This book details a variety of industries where the Reflectortight has been PROVED. It deals with problems of erection and maintenance and answers a number of the questions most usually asked by Engineers with experience (often bitter experience) of lighting in corrosive atmospheres.

SEND FOR YOUR COPY NOW . . .

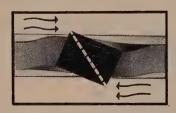


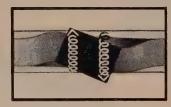
.A.L. IS A REGD. TRADE MARK



# Why have twisted teeth?

The tapered teeth of "Shakeproof" lock washers are twisted to create exceptional spring tension between locking surfaces. Vibration makes this locking action more powerful. Each tooth acts as a strut to prevent the nut or screw backing off and the teeth's sharp edges anchor without milling. You won't find a tighter, more trustworthy lock than tapered-twisted tooth "Shakeproof" Lock Washers, available in hardened and tempered high carbon spring steel, or phosphor bronze.





A.I.D. APPROVED

# SHAKEPRO

## **LOCK WASHERS AND** LOCKING TERMINALS

British Patents Nos. 406556 - 518146

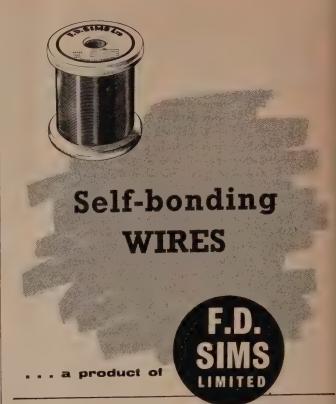
#### BARBER & COLMAN LTD.

BROOKLANDS, SALE, CHESHIRE TELEPHONE: SALE 2277 (3 LINES) TELEGRAMS: "BARCOL" SALE



Dealers and Factors enquiries to the following appointed "SHAKEPROOF"
Stockists:

George Boyd & Co. Ltd. 229 Buchanan Street, Glasgow C.1. Brown Bros. Ltd. (all Branches) Wm. Galloway & Co. Ltd. Blaydon-on-Tyne
F. Miller & Co. (London) Ltd. Rectory Road, Acton, London W.3.
Nettlefold & Moser Ltd. (all Branches) Nobby Distributors Ltd. 438 Harrow Road, London W.9. Wordrew Ltd. 173 Princess Street, Manchester, 1.



P.O. Box 8 Hazelhurst Works, RAMSBOTTOM, Manchester

Telephone: Ramsbottom 2213/4/5

Telegrams: "SIMS" Ramsbottom

London Office and Stores: 106 Newlands Park, Sydenham London S.E. 26 Telephone: SYDenham 4211/2

555

### PITMAN TECHNICAL BOOKS

#### PRINCIPLES OF ELECTRICITY AND MAGNETISM

By Y. Rocard, translated by G. F. Herrenden-Harker, M.A. Here is the first English translation of this classic French work. Coming from a country where teaching is regarded as an art, it is based on a course given by Professor Rocard at the Sorbonne and covers the groundwork of the subject with exceptional concision and clarity. Price 70/- net.

#### RADIO AND ELECTRONICS, Vols. I and II

Edited by J. H. Reyner, B.Sc.(Hons.), etc.

This two-volume work is designed to provide the student, the craftsman, and the young professional engineer with a knowledge of the fundamental background to the wide and steadily increasing use of radio and electronic techniques. Price £5 5s. per set.

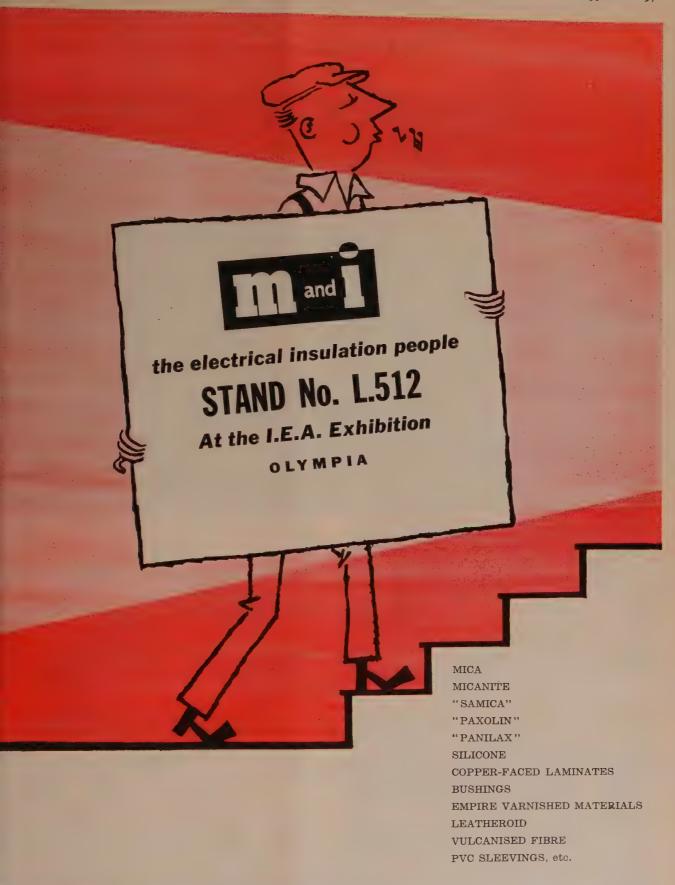
#### FUNDAMENTALS OF ELECTRONIC DEVICES AND CIRCUITS

By Wells L. Davis and Herman R. Weed.

A new book which covers much of the electronics material dealt with in British Degree and Diploma Engineering Courses. The chapters on Regulators and Magnetic Amplifiers are particularly well done and the book has a special value as a college or departmental library book for additional reading. Price 60/- net.

FROM ALL BOOKSELLERS

PARKER ST., KINGSWAY, W.C.2



# HE MICANITE & INSULATORS CO., LTD.,

ACKHORSE LANE, WALTHAMSTOW, E.17. TEL: LARKSWOOD 5500.

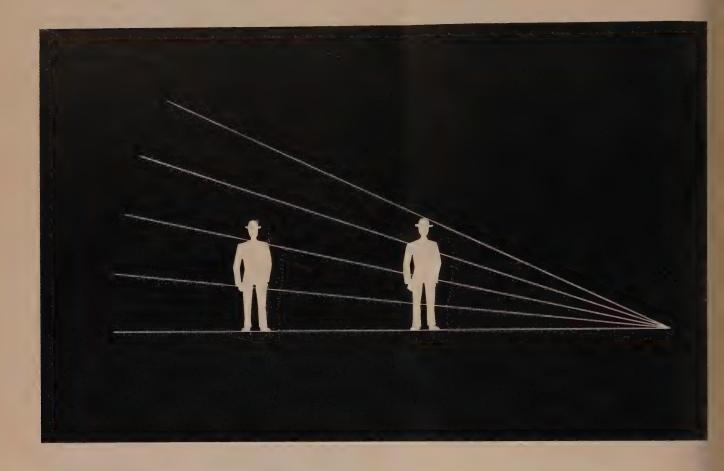
LEGRAMS: MYTILITE, LONDON, TELEX.

TELEX 25183

"SAMICA", "PAXOLIN" & "PANILAX" are registered trade marks



### When seeing must be believing



Measuring instruments are made to be seen and believed. They are analytical tools which serve industry via the man at the control panel.

The man whose judgment is of critical importance in so many complex modern processes.

Accuracy, reliability and *readability* are the three acknowledged components of Pullin design.



## PULLIN FOR PRECISION

#### MEASURING INSTRUMENTS (PULLIN) LIMITED

Electrin Works, Winchester Street, London, W.3. ACOrn 4651 & 8801 London Showrooms:

Electrin House, 93-97 New Cavendish Street, London, W.1. LANgham 4551-6

#### *TERMINATE* with

#### TER - MATE



TER-MATE patented TERMINAL studs are manufactured in five sizes: 5/16"; 1" B.S.W.; 0; 2; and 4 B.A. with or without barriers



Their unit construction enables them to be set up in any number of ways and in any direction on a flat plane

hus TER-MATE blocks

- Eliminate heavy costs for special moulding tools
- Dispense with heavy stocks of set number of way blocks
- Make costly frames unnecessary—save time and money
- Give visual and positive connections Clear, plastic guards are available C.S.A. Approval No. 14936

end for samples and literature to:

#### TERMINATION EQUIPMENT

Tel.: Nottm. 76638/9

ONDON OFFICE: B. N. DUNSTER, M.I.E.E.

RAVENSBOURNE 3571



#### METWAY

TERMINAL BLOCKS 5-75 AMP.

STEATITE NYLON FIBRE



BAKELITE P.V.C. RUBBER

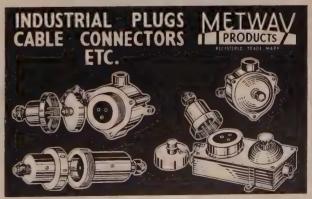
ASK FOR CATALOGUE NBQ/12ER



ASK FOR CATALOGUE RGR/5ER



ASK FOR CATALOGUE OHS/1ER



ASK FOR CATALOGUE OHS/3ER

WE SHALL BE PLEASED TO SEND THE ABOVE CATALOGUES

METWAY - KEMP TOWN - BRIGHTON



## Reiffer

### HIGH VACUUM PLANT

- MOST UP-TO-DATE PLANT and METHODS BASED ON VAST INDUSTRIAL EXPERIENCE GAINED OVER 50 YEARS
- COMPLETE and FULLY AUTOMATIC DRYING and IMPREGNATING INSTALLATIONS for CABLES, TRANS-FORMERS, etc. to individual requirements
- IMPROVED PRODUCT QUALITY
- CONSIDERABLY REDUCED CYCLE TIMES
- These are some of the results of using PFEIFFER'S ROOTS and ROTARY PUMP SETS, etc.

Sole U.K. Distributors :---

MASON & MORTON LTD

Murray House, 3-5 Vandon St., London, S.W.I. Tel.: ABBEY 6746-8



Can we help you with your masking requirements? Whether the surface be concave, convex, plain or complex our Masking Tapes do a good job.

They are designed to meet the requirements of every type of industrial process. Send in the coupon below. We shall be happy to advise you.

	I grang
To: INDUSTRIAL TARREST TO THE TARRES	The same
To: INDUSTRIAL TAPES LTD., SPEEDFIX HOUSE,	
19-23 FEATHERSTONE STREET, LONDON, E.C.I. CLE 6881	
NAME COMPANY NAME	
ADDRESS	************
Diama. I. 1	And the same places are to the same are an are and the same places.
Please advise, without obligation, on the following problem	4
在 1	
	the section of the section of the section of the section of
TEMPERATURE RANGE DURATION OF PROCESS	
(I.F.) DURATION OF PROCESS.	and him and him has any seeing the department for the first day the department
(A.F.)	(IT/20)
	(11/20)

#### **Enfield-Standard**

## a new name in CABLE MAKING

The power cable interests of Enfield Cables Limited and Standard Telephones and Cables Limited have been merged into a new company—Enfield-Standard Power Cables Limited.

The new company is making a complete range of cables insulated with rubber, thermoplastics and impregnated paper. Telephone cables are not included in the manufacturing range of the new company.

**Enfield-Standard Power Cables Limited** 

Registered Office: Connaught House, Aldwych, London W.C.2

BRIMSDOWN WORKS · ENFIELD · MIDDLESEX

TELEPHONE: HOWARD 2468

## MERCURY SWITCHES

THE MERCURY SWITCH
MANUFACTURING COMPANY
LIMITED are the largest specialised
manufacturers of Mercury Switches
in Great Britain. These are made
to exceptionally high and uniform
standards of quality.
Since its inception in 1932, this
Company has concentrated solely
on the production of Mercury
Switches. It has thereby obtained
the widest possible experience
and expert knowledge of design,
manufacture and application.



THE MERCURY SWITCH MANUFACTURING CO. LTD. WEST DRAYTON - MIDDX.

West Drayton 3157

MSII

FOR PAPER INSULATION
SWITCH TO

## WATSON'S of Linwood

R. & W. WATSON LTD.

LINWOOD RENFREWSHIRE SCOTLAND

Telephone: Johnstone 866-9

Watlin Paisley Telex

LONDON: Northgate House, 20-24 Moorgate, London, E.C.2.
MONarch 2812. Watlin London Telex

BIRMINGHAM: Lombard House, 144 Great Charles Street, Birmingham 3. CENtral 1505

MANCHESTER: 14 St. Peter's Square, Manchester. CEN. 0202

By Jest - The Best - 'PALNUT'



By courtesy of Metropolitan-Vickers we show above 'Palnuts' fitted to the core and windings of a 750 KVA transformer of their manufacture.

All sizes and threads 6 BA to 3" BSF. Special threads to customers' requirements. **PALNUTS** are used in all branches of the Engineering field including:—

TRANSFORMERS - RAIL TANK CARS MOTOR
CARS - T.V. MASTS DIESEL ENGINES RAILWAY
TRACK SIGNALS CRANES - LIFTS - AERO ENGINES
WASHING MACHINES - STONE CRUSHING EQUIPMENT, ETC.

For further details and N.P.L. Report write:-

THE PALNUT CO. LTD.
Palnut Works, 3 Arthur Street, Hove, Sussex

ESTABLISHED 1919

Telephone HOVE 70427 Telegrams PALNUT, HOVE

## RELAY USERS "CORREX" TENSION GAUGES

The only instrument solely designed for accurately measuring tension on Relays, Contacts, Switchgear, and electrical apparatus of all kinds.



Gauge measures in grammes, and a large range of sizes is produced to cover from 0.3-2,000 grammes.

Swiss made and guaranteed.

Write for illustrations and prices from the Sole Distributors throughout the U.K. JAMES W. CARR & CO. LTD.

Dept. SALES, 7-15, Rosebery Avenue, LONDON, E.C.1
Telephone: TERMINUS 8866 (P.B.X.)

## H.B. TRANSFORMER TAPPING SWITCH TYPE L



Interlocked with micro

Pull Handle to release Lock, then turn

Also Type O without interlock and Type C for on load switching

SINGLE OR MULTI POLE
Phone: Kings Norton 1604

HENLEY BURROWES & CO. LIMITED
Factory Centre: KINGS NORTON, BIRMINGHAM

# TWO New Water Heater Control Switches

Volex

20 Amp. and 30 Amp. SURFACE MOUNTING **BROWN OR CREAM FINISH** 



#### WITH SELF-CONTAINED MOUNTING BLOCKS

#### 20 AMP. A.C.

V/5303 Without Pilot light ... 6/8d. each V/5303CR ,, ,, Cream 7/8d. ,, V/5304 With Pilot light 9/-V/5304CR ,, ,, Cream 10/-

#### 30 AMP. A.C.

V/5203 Without Pilot light ... 7/8d. each V/5203CR ,, ,, Cream 8/8d. ,, V/5204 With Pilot light ... 10/- ... V/5204CR ,, ,, Cream | | /-





VOLEX ELECTRICAL PRODUCTS LTD.

Telephone: PENDLETON 4373

SALFORD 6 Telegrams: VOLEXPROD, Salford 6



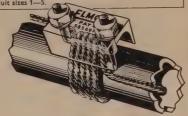
## EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948

IN 4 SIZES	A123	B45	C67	D8910
for earthing cables up to	7/0,036″	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes i.e. in trade terms	1, 2 & 3	4 & 5 1" and 1\frac{1}{4}"	6 & 7 1½" and 2"	8, 9 & 10 2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029 and for B.S. conduit sizes 1—5.

"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.



### **ELECTRICAL FITTINGS**



Flexible-to-rigid
CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes:

Electric Thread (Male) \$\frac{8}{2}" \frac{2}{4}" \1" \1\frac{1}{4}" \1\frac{1}{4}" \2" \2" \\
Inside Diameter \\ \frac{8}{2}" \frac{2}{4}" \1" \1\frac{1}{4}" \1\frac{1}{4}" \2" \2"

Electric Thread (Male) \$" \$" 1" 12"
Inside Diameter Flexible Conduit 2" \$" 3" 1"



#### WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



#### CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread

\$" \$\frac{2}{3}" 1" 1\frac{1}{4}" 1\frac{2}{3}" 2"

FEMALE: Electric Thread

\$" \$\frac{2}{3}" 1" 1\frac{1}{4}" 1\frac{1}{4}" 2"



FEMALE
Flat Face Section for
Spanner (except 2"
size, which is round)

CEILING PLATE
One hook





#### CONDUIT

For fluorescent lamps and overhead lighting fittings. Screwed  $\frac{3}{4}$ " thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter —2" centres diametrically opposed. Designed in accordance with British Standard Specification.

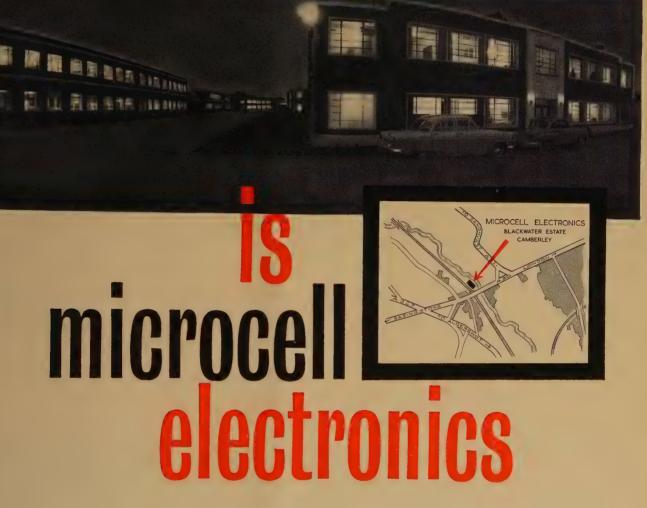
Both made in aluminium alloy



Manufactured by M.MOLE & SON LTD. BIRMINGHAM · 3 · ENGLAND Est . 1835



# this



Microcell Electronics facilities for Industry are comprehensive and are now available for manufacturers of commercial electronic equipment.

A highly qualified staff of Researchers, Development and Production Engineers and Drawing Office Personnel, backed by the full resources of the Company's Blackwater estate, offer a complete service for Design Study, Development, Original Research, Production and Environmental Testing. Manufacturing capacity at Blackwater is equipped to produce either the "one off" special or larger quantities by the latest mass-production techniques.

Engineers and Senior Executives are invited to write to the Sales Manager at the Company's Kingsway address for further details.



9 Kingsway, London, W.C.2. Telephone: Covent Garden 1262
Factory and Laboratories, Blackwater, Nr. Camberley, Surrey. Tel.: Camberley 3461

# large flameproof motors...

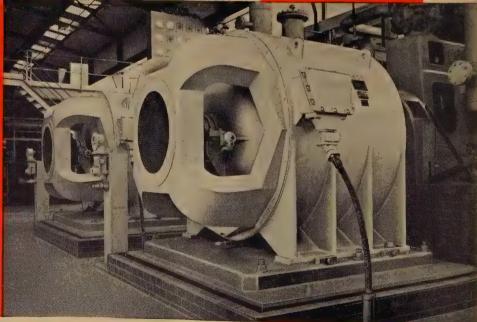
FOR CHEMICAL WORKS, OIL REFINERIES,
PIPELINE INSTALLATIONS, AND INDUSTRIES WHERE
EXPLOSIVE ATMOSPHERES PREVAIL.

The important installation of large flameproof motors at the Olefine Works of Imperial Chemical Industries Limited at Wilton in Yorkshire indicates Bruce Peebles' broad experience in research and manufacture, and participation in new developments.

Each motor is totally-enclosed, fan-cooled, with bearings outside the flameproof enclosure, and is fitted with steel tubes surrounding the stator. Internal fans circulate the air within the motor to transfer heat to the tubes, while an external fan drives free air through the tubes to remove heat quickly and effectively.

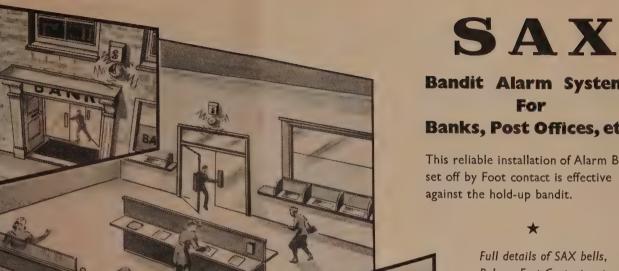


300 b.h.p.
flameproof
squirrel-cage
motors, designed for
direct-on-the-line
starting, driving gas
compressors at the
Olefine Works of
Imperial Chemical
Industries Limited
at Wilton.



BRUCE PEEBLES & CO. LIMITED . ENGINEERS .

**EDINBURGH** 



24 COMMERCE ROAD, BRENTFORD, MIDDX.

Established in 1855

**Bandit Alarm Systems** 

Banks, Post Offices, etc.

This reliable installation of Alarm Bells set off by Foot contact is effective

> Full details of SAX bells. Relays, Foot Contacts, etc. and Diagrammatic Layout to suit particular requirements, supplied on request.

JULIUS SAX & CO. LTD.

Telephone: ISLeworth 6034/5



## ONTACTUM score aqu



Accepted by the Council of Industrial Design for "Design Index"

Make contact with Contactum

Write or phone for full details and prices of these stylish switches

with these up-to-the-minute

**FLUSH SWITCHES** 





Modern, streamlined design.

One, two or three switches on plates of identical size.

For plaster depth box or B.S. 1299 deep-steel box.

In White or Brown Bakelite.

Silver faced contacts.

A.C. 5 amp. Single Pole.

CONTACTUM LTD. VICTORIA WORKS, EDGWARE ROAD, LONDON, N.W.2. (GLAdstone 6366-7)

**ELECTROSPRAY** 

#### THE ANTI-TRACKING ANTI-CORROSION AGENT

In areas which are prone to condensation and corrosion, electrical equipment tends to suffer from tracking and (in common with other equipment) corrosive decay. A special phenyl-methyl silicone fluid in aerosol containers is now available which, by fine spray, places an even coating over faces being treated. This film is completely water-repellent and also prevents corrosion over a long period of time.

Highly resistant to oxidation and with a high flash point and low volatility, Ambersil Electrospray-available only from the producers—is marketed at:-19/6d. per aerosol.

**OVERSEAS AGENCIES** AVAILABLE





**JUST A** LITTLE **SQUIRT** 

and Ambersil Electrospray does the rest

AMBER OILS LTD., 11a, ALBEMARLE STREET, LONDON, W.1 Mayfair 6161/3



## FURSE

#### LIGHTNING CONDUCTORS

and Earthing Equipment

Great Britain

Illustrated Trade Literature available upon request. Advisory and Technical Information Service free.

W. J. FURSE & CO. LIMITED
33 Traffic Street (Tel. 83471 - 5 lines) NOTTINGHAM

Also LONDON, MANCHESTER, BIRMINGHAM, BRISTOL

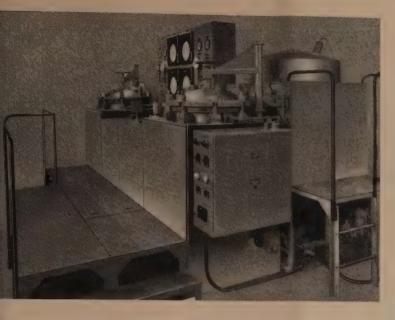
PLASTIC CABLE **CLIPS** 



The Cable Clip is designed to 'push fit' on to the cable. The carbon steel pin is already part of the unit and will drive into wood, plaster or mortar

HIATT & CO. LTD.

**Baltimore Road** Birmingham 22B



'B-W' Duplex oil-filling unit for "C" core transformers and similar applications.

# AIGH VACUUM DRYING AND PRESSURE IMPREGNATING

a vital process in the electrical industry and essential in electronic, instrument and telecommunication fields, where problems is sociated with fine gauge wires exist, and where small space actors are only achieved through efficient vacuum and pressure impregnation.

arlow-Whitney have a wealth of valuable experience and you are nvited to take advantage of their technical advisory service for any pecial problems in this field.

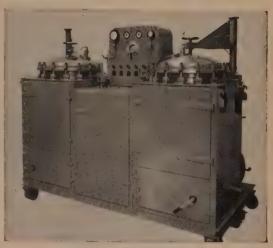
WRITE FOR BROCHURE QUOTING REFERENCE AI60

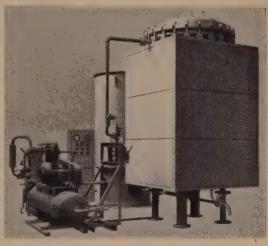


2 Dorset Square, London, N.W.I

Telephone: Ambassador 5485-6

WORKS: LONDON & BLETCHLEY

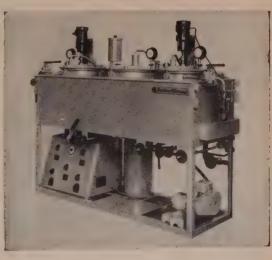




Top. Typical 'B-W' self-contained plant for the electronic industry.

Centre. Floor or pit mounting unit for processing larger components.

Below. Barlow-Whitney custom-built equipment for the preparation of polyurethane.



Keep an accurate record

an



record!

There is an Elliott Recorder that is right for your purpose, embodying the best in electrical engineering to make it easy to use, simple to service, consistently accurate.

The range includes:-

#### **Elliott Miniature Electrical** Recorders

indicate and record a.c. or d.c. values. Flush-mounting model needs panel space of only 115 in. x 55 in. Operation pen units and high and low level contacts available. Publication RE3.



#### **Elliott Multi-Channel Electrical Recorders**

Miniature moving coil movements. Record a.c. or d.c. values on 2-6 3 in. wide channels simultaneously. Polyphase Wattmeter Elements, Operation pen units and high and low level contacts available. Publication RE4.



#### **Elliott Strip Chart Recorders**

for amps, volts and watts. Movements available: - Moving Coil for d.c.; Moving Coil Rectifier for a.c.; Moving Iron, primarily for a.c.; Dynamometer for a.c. or d.c. Publication RE2



#### **Bristol's Series 500 Circular Chart Recorders**

(Voltmeters and Ammeters). Permanent mounting or portable for indoor or outdoor use. Robust Moving Iron element. Stable calibration, high actuating torque, low load. Bulletin E.E. 1100



Electrical Measurement Division

#### ELLIOTT BROTHERS (LONDON) LTD

Gentury Works Lewisham London SE13 Tideway 1271



A member of the Elliott-Automation Group



# reauce coiled coi mp prices!

Atlas clear and pearl coiled coil lamps give your customers up to 20% more light for the equivalent wattage, and now, at the same prices as single coil.







## Lighting can be tricky.

It's a matter of getting the light on the right part of the job! Some industrial lighting problems are nearly as tricky as the one depicted above.

E.D.L. fittings have been designed with over 30 years' experience of the snags and difficulties involved. They are sturdy, easily adjusted, free from sag.

Get maximum lighting efficiency with



INDUSTRIAL LOCAL LIGHTING FITTINGS

for Mains or Low Voltage

THE ELECTRIC DEPÔT LTD., Redbrook Lane, Brereton RUGELEY, Staffs. Telephone: Rugeley 711



presents



#### A GUIDE TO THE NATIONAL INSURANCE **ACT 1959**

This Guide explains in simple terms the background to the problem which every employer faces today, and brings together in one booklet the salient points otherwise only available from detailed study of the regulations, memoranda, etc. issued from time to time by various Government Departments.

The Booklet will be of particular value to those employers who are considering instituting a new Scheme in order to be able to contract out of the Graduated State Scheme. We shall be happy to send you a copy, free of charge, on application to our nearest Branch Office (see telephone directory), or to Life Department

EAGLE STAR INSURANCE COMPANY LIMITED Wimborne House, 22 Arlington St. London, S.W.1



#### CONNECTORS and ADAPTORS

An excellent range of the above Tunion products are available to meet various requirements. TM188. This connector is for attaching live flexible lead to appliances requiring an earth

connection. It consists of recessed and flanged 3-pin plug base for fixing permanently

to appliance and a well shrouded and recessed socket fitting for terminating flex particularly suitable for fluorescent fittings. Both portions are effectively

inter-keyed to prevent insertion in wrong position. TM13. This adaptor is absolutely safe. Live sockets are so well shrouded that it is impossible either to make accidental finger contact

Further types of adaptors and connectors are shown on pages 22 and 25 of our 34 page illustrated Brochure 1453/ER which also gives details of over 400 Tunion products. A copy will be sent you on request.

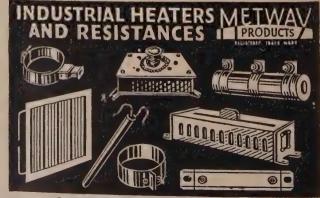
which may be alive, exposed.



#### GEORGE TURNOCK LTD.

Tunion Works, Navigation Street, WALSALL, Staffs Telephone: Walsall 4966





For full details ask for Catalogue No. JYL/30/ER METWAY ' KEMP TOWN ' BRIGHTON



## LEROY self-regulating alternators

- NO TIME LAG
- NO BRUSHES
- NO COMMUTATORS
- NO A. V.R.
- NO SLIP RINGS
- NO MAINTENANCE

For full details apply to

LEROY MOTORS 68 Victoria Street, London, S.W.I TATe Gallery 9675

Ask your Wholesaler for

## "ARMORDUCT" CABLES

## Always the Best

They comply in every respect with dimensions and tests laid down in the Amendments of the latest B.S.I. Specifications, and are manufactured throughout in our Factories at Long Eaton and Dorking



#### ARMORDUCT CABLE CO. LTD.

Factories: Long Eaton and Dorking 1-3 Brixton Road, LONDON, S.W.9. Telephone: RELiance 7044 (5 lines) Telegrams: Armorduct, London, S.W.9. ABC Code (5th Edition)





## MEGOHMOID

insulating tape

Manufactured to the very highest standards including BS 1078, Megohmoid Adhesive Insulating Tape is one of the many Megohmoid products which serve the electrical industry. Samples and prices from the sole manufacturers.

OPENSHAW BRIDGE WORKS . MANCHESTER II

Tel: EAST 2686 (5 lines) "Telex 66269". Cables: "Megohm Telex Manchester"



Lindsay Williams

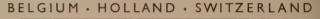
Looking in the right direction



Katcliffe

F. S. RATCLIFFE (ROCHDALE) LTD.,
Crawford Spring Works, Norman Road, Rochdale
Phone: Rochdale 40415
Telex 63178

CW5968/1



GLOVAC GL

FLUORESCENT STARTERS MINIATURE NEON INDICATOR

LAMPS CORONA STABILIZERS

FLUORESCENT HAND INSPECTION LAMPS MERCURY >

m

Z

Manifold Electric Co. Ltd.

124 St. Margaret's Rd., Twickenham, Middx

S. AMERICA · PORTUGAL · SPAIN

#### AGENTS WANTED

Woden Transformer Co. Lfd., Oxford Street, Bilston, Staffs, invite applications from well-established houses with adequate technical representation, as Commission Agents, to handle their well-known transformers up to 5 mVA capacity in the following areas:

South-West England

Scotland

Northern Ireland

North-West England
. (Lancashire, etc.)

North-East England (Yorkshire, Co. Durham, etc.)

(Torksinie, Co. Durnam, erc.

Write to:

Sales Director, Woden Transformer Co. Ltd..

### Classified Advertisements

LASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

ISPLAYED CLASSIFIED: -48/. per single column inch.

There an advertisement includes a Box Number there is an additional charge of 1/-.

ERIES DISCOUNTS for consecutive insertions; -13, 5%; 26, 10%; 52, 15%.

ITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if dered and prepaid with the first insertion.

beques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW

FPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, to ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a totation appearing under a Box Number does not wish his reply to be forwarded to a particular firm tindividual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL EVIEW. The name of an advertiser using a Box Number cannot be disclosed.

#### OFFICIAL NOTICES, TENDERS, ETC.

#### **AIREBOROUGH** URBAN DISTRICT COUNCIL

Installation of Class "B" Street Lighting in Roydfield Terrace, Rufford Avenue and South View Road, Yeadon; Larkfield Road and Batter Lane, Rawdon; Netherfield Road, Guiseley

PENDERS are invited for the supply and installation of Class "B" Mercury Vapour treet Lighting in Roydfield Terrace, Rufford wenue and South View Road, Yeadon; Larkfield toad and Batter Lane, Rawdon; and Nethereld Road, Guiseley. Approximate number of courts 73

oints, 72.
Separate tenders are invited as follows:

- (1) Supply and erection of columns and brackets and fitting and wiring of lanterns to columns, etc.
- (2) Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council eserve the right to accept separate tenders from

rim that tender for both, but the Council ifferent firms.

Copies of the plan, instructions to persons endering, specifications, bills of quantities, orms of tender and schedule of rates and prices that the second of the Engineer and Surveyor to the Council at the address elow, on payment of a deposit of two guineas, thich will be returned on receipt of a bona fide ender or the return of the documents.

Tenders, enclosed in a plain sealed envelope, andorsed "Tender for Street Lighting," must be delivered to the undersigned not later than aid-day on Monday, the 13th June, 1960.

The Council does not bind itself to accept the lowest or any tender, and the acceptance at tender or tenders will be subject to the tentaining by the Council of any requisite onsents.

RALPH H. HULME, Clerk of the Council.

ouncił Offices, Micklefield House, Rawdon, Leeds.

4400

#### COUNTY BOROUGH OF SOUTHEND-ON-SEA

#### Proposed Electrical Installation at Wentworth High School

TENDERS are invited for the performance of works in connection with the proposed ectrical Installation at Wentworth High

General conditions of contract and drawings as be inspected and copies of form of tender, ecification and drawings obtained on applicant to the Borough Architect, 30, Alexandra reet, Southend-on-Sea.

Sealed tenders addressed to the undersigned dendorsed "Proposed Electrical Installation, age 1, Wentworth High School," are to be livered to this office before 3 p.m. on Friday, I June, 1960, and no tender received therefore will be considered.

No tender will be received except in the scial envelope provided, which shall not bear and a mane or mark indicating the sender.

The Corporation do not bind themselves to sept the lowest or any tender.

ARCHIBALD GLEN,

ARCHIBALD GLEN, Town Clerk.

#### CITY OF BIRMINGHAM

CITY OF BIRMINGHAM

THE PUBLIC WORKS COMMITTEE invite separate tenders on a fixed price basis: (A) THE ELECTRICAL INSTALLATION AND (B) THE OIL-FIRED HEATING INSTALLATION AT THE INDUSTRIAL RESEARCH LABORATORIES, HOLLIDAY STREET, BIRMINGHAM, I.

General conditions (which include the Corporation's usual Fair Wages and Conditions of Labour Clause) may be inspected at the Mechanical and Public Lighting Department, 38, Cambridge Street, Birmingham, I. Copies of the specification and plans, etc., can be obtained on payment of £2 2s. for each contract at the office of Sir Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre, Birmingham, I, to whom all cheques should be made payable. The deposit will be returned on receipt of a bona fide tender.

Tenders enclosed in the envelope provided for the purpose must be scaled and delivered to the Town Clerk's Office (Room No. B.21), Council House, Birmingham, I, not later than Twelve noon on Wednesday, 1st June, 1960, when they will be opened. Tenders received after that time will be rejected.

The Committee do not bind themselves to accept the lowest or any tender.

T. H. PARKINSON,
Council House,

T. H. PARKINSON, Town Clerk.

Council House. Birmingham, 1.

#### ELECTRICITY CORPORATION OF NIGERIA

Invitation to Tender

Low-voltage Switchboards

THE ELECTRICITY CORPORA-for the supply of the following:—

I Low Tension 15-MVA, 6-panel Switchboard and I 10-panel Switchfuse Board.

Tender documents giving further details of the contract may be obtained from the Resident Engineer, Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2.

Each tender must be enclosed in a sealed envelope marked "Confidential, Tender for supply of Low Voltage Switchboards," and must be received at the Office of the Secretary, Electricity Corporation of Nigeria, Electricity Headquarters, Private Mail Bag 2030, Lagos, Nigeria, West Africa, not later than noon on 22nd June, 1960. Tenders received in any other manner will not be considered.

The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

Further information concerning this contract may be obtained on application to the Resident Engineer.

GEORGE W. NICOL, Acting Secretary to the Corporation. Advertisements are accepted up to first post on Monday of the week of issue

If displayed with boxed rules, name or symbol block by Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW Dorset House, Stamford Street London, S.E.I

Original testimonials should not be sent with applications for employment

#### CHESHAM URBAN DISTRICT COUNCIL

Street Lighting, Stage 2

TENDERS are invited for the supply and erection of 49 Steel Group "A" Lighting Columns fitted with 250-watt colour-corrected mercury vapour lanterns and 24 Steel Group "B" Lighting Columns fitted with 125-watt colour-corrected mercury vapour lanterns, with all lamps and control gear.

Specifications and bills of quantities may be obtained and conditions of contract and layout drawings inspected at the office of the Engineer and Surveyor of the Council.

Tenders in plain sealed envelopes bearing the words "Street Lighting, Stage 2," must be received by me not later than Saturday, the 11th June, 1960.

The Council do not bind themselves to accept the lowest or any tender.

the lowest or any tender.

W. I. NASH,

Council Offices, Chesham, Bucks. Clerk of the Council. 4514

#### ROTHWELL URBAN DISTRICT COUNCIL

#### Proposed Street Lighting in the Rothwell Urban District

TENDERS are invited for the provision and erection of 494 45-watt Group B Lighting Units with Reinforced or Prestressed Concrete Columns in the Rothwell Urban District.

Plans may be seen and conditions of contract, specification and bill of quantities obtained upon application to the Engineer and Surveyor on deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently

withdrawn.

Tenders to be enclosed in plain sealed envelopes endorsed "Street Lighting," and returned not later than 9 a.m. on 3rd June, 1960, to the undersigned.

ALLEN T. S. ROBERTSON, Clerk of the Council.

Civic Buildings, Rothwell, Nr. Leeds.

#### CITY OF WINCHESTER

#### Street Lighting: Alresford Road (A.31) and Bar End Road (C.461)

TENDERS are invited for the erection complete of approximately 50 Lighting Points involving 25-ft. Steel and 16-ft. Cast Iron Columns for 250-watt, 120-watt and 80-watt colour-corrected Mercury Lighting.

Specification, bill of quantities and form of tender may be obtained from the City Engineer and Surveyor, Guildhall, Winchester, at whose office plans may be inspected. A deposit of £2 2s. will be required but will be refunded on receipt of a bona fide tender.

Tenders in a plain envelope endorsed "Alresford Road Lighting" should be addressed to the undersigned and received not later than first post on Wednesday, 8th June, 1960.

R. H. McCALL,
Guildhall, Winchester.

Town Clerk.

3rd May, 1960.

Guildhall, Winchester. 3rd May, 1960.

CLASSIFIED ADVERTISEMENTS

ARE PREPAID

Official Notices (continued)

#### BOROUGH OF EALING

Street Lighting, Madeley Road and Queens Drive

CONTRACT "A": Supply of 41 140-watt Sodium Lanterns, complete with gear and

lamps.
CONTRACT "B": Supply and erection of 41 25-ft. mounting height Steel Columns.
Details obtainable from the Borough Engineer, Town Hall, Ealing, London, W.5, on payment of £5 for each tender, returnable on receipt of a bona fide tender.
Tenders to the Town Clerk, Town Hall, Ealing, London, W.5, by noon 31st May, 1960.
4386

#### SITUATIONS VACANT

See "Replies to Box Numbers" on page 115)

#### SOUTHERN RHODESIA

Vacancy for Electrical Engineer (Protection)

Salary scale £1,025 × £102 10s. to £1,332 10s. × £76 17s. 6d. to £1,563 2s. 6d. × £51 5s. to £1,768 2s. 6d. per annum

X £76 178. 6d. to £1,563 28. 6d. × £51 58. to £1,768 28. 6d. per annum

A PPLICATIONS are invited for the fixed A establishment post of ELECTRICAL ENGINEER (Protection) in the Salisbury Municipal Electricity Department, on the scale £1,025 × £102 108. to £1,332 108. × £76 178. 6d. to £1,563 28. 6d. × £51 58. to £1,768 28. 6d. per annum. No allowances are payable.

Commencing salary is based on qualifications and experience. There is a barrier at £1,563 28. 6d. per annum, above which no engineer can rise without being a Corporate Member of the British Institution of Electrical Engineers, and the maximum entry point into the grade is £1,614 78. 6d. per annum.

Candidates must be Graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree, and have had not less than five years' experience in general protection work.

Consideration however will be given to applicants who have not the above qualifications but who have had extensive practical experience. The salary scale applicable in such instance will be £1,568 5s. × £51 5s. to £1,722 per annum, commencing salary being at the minimum of the grade.

The successful applicant will work under the direction of the Test Engineer in the Consumers' Engineers' Section and his duties will comprise mainly:—

I. Design and commissioning of all types of protection schemes on generators, feeders, motors, transformers and other

Design and combinistoning of an types of protection schemes on generators, feeders, motors, transformers and other types of electrical equipment.
 Determination of relay settings and the calculation of fault currents over the

system.

3. Supervision of staff engaged in the maintenance and repair of all relays and instruments associated with protection schemes

The Department has an extensive supervisory

The Department has an extensive supervisory indication, control and telemetering scheme and experience with similar equipment is desirable. Experience with similar equipment would be considered an advantage.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital state should be stated and copies of not more than three recent testimonials may be forwarded.

forwarded. Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Davis & Soper Limited, 52-54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 4th June, 1960.

#### UNITED KINGDOM ATOMIC ENERGY **AUTHORITY**

#### CULHAM LABORATORY

NEAR ABINGDON, BERKS

TWO posts exist at the new laboratory now being set up by the U.K.A.E.A. to carry out research into controlled thermonuclear reactions and plasma physics.

#### POST 1: ELECTRICAL FOREMAN

To supervise manufacture of electrical equipment for the first major experiment and be responsible for installation and maintenance of the equipment.

#### POST 2: MECHANICAL FOREMAN

To supervise manufacture, installation and operation of experimental plant and equipment for the first major experiment.

OUALIFICATIONS: (i) Recognised engineering apprenticeship or equivalent

training.

(ii) Supervisory experience.

O.N.C. or equivalent is desirable.

In addition:—
For POST 1: Experience in the high-voltage field necessary and electronics knowledge useful.
For POST 2: Experience of all types of machinery and fitting to very fine

SALARY: £925 (at age 30 or over) to £1,105 p.a. Housing and contributory pension schemes.

Send POSTCARD for details to the Senior Recruitment Officer (1663/48), A.E.R.E., Harwell, Didcot, Berks.

#### CENTRAL ELECTRICITY GENERATING BOARD

#### Midlands Project Group

A PPLICATIONS are invited for the follow-A ing appointments in the Midlands Project Group at Rugeley Power Station Site.

(a) SECOND ASSISTANT ENGINEER (Mechanical), N.J.B. Grade 4, £1,195-£1,545 per annum, Schedule C (Vacancy No. MPG.30/60).

Applicants should have had experience in the manufacture and erection of boilers, turbollers and other mechanical equipment. alternators and other mechanical equipment associated with a modern power station. Appropriate technical qualifications will be an

(b) SECOND ASSISTANT ENGINEER
(Electrical), N.J.B. Grade 4,
£1,195-£1,545 per annum, Schedule C
(Vacancy No. MPG.31/60).
Applicants should have had experience in
the manufacture, erection, maintenance and
operation of electrical plant, as installed in
modern power stations. Appropriate technical
qualifications will be an advantage.

qualifications will be an advantage.

(c) THIRD ASSISTANT ENGINEER
(Mechanical), N.J.B. Grade 5,
£1,090-£1,300 per annum, Schedule C
(Vacancy No. MPG.32/60).

Applicants should have a fundamental training in mechanical engineering and should have had experience in the manufacture and erection of mechanical equipment associated with a modern power station. Appropriate technical qualifications will be an advantage.

(d) THIRD ASSISTANTE ENGINEER

(d) THIRD ASSISTANT ENGINEER
(Electrical), N.J.B. Grade 5,
£1,090-£1,300 per annum, Schedule C
(Vacancy No. MPG.33/60).
Applicants should have a fundamental train-

ing in electrical engineering and should have had experience in the manufacture, erection, maintenance and operation of electrical plant as installed in modern power stations. s installed in modern power stations. Appropriate technical qualifications will be an advantage.

(e) SECOND ASSISTANT ENGINEER
(Progress), N.J.B. Grade 4,
£1,195-£1,545 per annum, Schedule C
(Vacancy No. MPG.34/60).
Applicants should preferably possess a Higher
National Certificate in either Mechanical or
Electrical Engineering and have served a recognised engineering annuraliceshim. Experience nised engineering apprenticeship. Experience in the construction of heavy plant as installed in modern power stations, either in a manu-

facturer's works or on site, is essential, and a knowledge of the civil engineering work involved

would be an advantage.

The selected candidate will be required to maintain up-to-date charts on the progress of the works on site in accordance with previously agreed programmes, and to assist the Resident Engineer in anticipating any divergence from these programmes. Ability to co-ordinate with Regional P.I.T. Officers will be required.

Applications for the above-mentioned posts Applications for the above-mentioned posts should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, 341, Bournville Lane, Birmingham, to be returned to him not later than 27th May, 1960.

#### LONDON ELECTRICITY BOARD

#### General Assistant Engineer

A PPLICATIONS are invited for the above position. Initially the successful candidate will be located at 84, Romford Road, Stratford,

will be located at 84, Romford Road, Stratford, London, E.15.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be £610 per annum rising to £745 per annum, inclusive of London allowance. allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.z. Please quote ref. PER/V/2933/R. 4518

#### MERSEYSIDE AND NORTH WALES **ELECTRICITY BOARD**

ENIOR ASSISTANT ENGINEER (Technical) required at No. 2 Sub-Area Headquarters, Sandiway House, Northwich, Cheshire. Salary within range £1,470/£1,575 per annum (N.J.B. K/4).

Applicants should have experience in modern protective systems and metering practice, including the testing and commissioning of high voltage switchgear, transformers and associated equipment. Technical qualifications desirable.

Duties will include responsibility for the supervision of meter testing and certification.

Appointment subject to medical examination. Pension scheme.

Pension scheme.
Application forms obtainable from the Manager at the above address. Closing date, 30th May, 1960.

## NO FUTURE IN YOUR PRESENT POSITION?

are a medium-sized virile company with a forty-year reputation for electrical control equipment presenting unique opportunities to forward-looking men joining our Research Development and Production teams. A new expansion programme calls for suitably qualified staff to exploit an interesting range of applications, from guided missile work to industrial automation. We offer secure, pensionable, progressive posts and the chance to BE SOMEBODY with a company quick to recognise and reward ability.

are invited to apply for the following positions if you have the qualifications required coupled with a forceful outlook on today's technical problems and developments.

#### PHYSICIST

for the special study of semi-conductors and rotating mechanisms as applied to motor control equipment. Graduate or equivalent qualifications.

#### **DESIGN ENGINEERS** APPLICATION ENGINEERS PLANNING ENGINEERS CONTRACTS ENGINEERS **CONTROL GEAR ENGINEERS**

All the above are required for development of our motor control gear programme. Qualifications—H.N.C. or equivalent practical experience.

#### **ELECTRONIC ENGINEERS**

for the application of semi-conductors to Automation. H.N.C. or equivalent practical experience.

#### TIME & MOTION STUDY ENGINEER

O.N.C. or equivalent.

#### ENGINEERING ESTIMATORS O.N.C. or equivalent.

#### DESIGN DRAUGHTSMEN DETAIL DRAUGHTSMEN CIRCUIT DETAIL DRAUGHTSMEN

O.N.C. or equivalent practical experience.

Contact Mr. Bridle, Personnel Officer, for full details in strictest confidence.

#### DEWHURST & Partner Limited

Inverness Road, HOUNSLOW, Middx. Tel.: Hounslow 0083 (12 lines)

239

#### YORKSHIRE ELECTRICITY BOARD

#### No. 7 (Grimsby) Sub-Area GRIMSBY DISTRICT ISTRICT ENGINEER.

Candidates should be Corporate Members of Enstitution of Electrical Engineers and ould have a wide experience in the electricity pply industry. The successful applicant will responsible for all engineering work on a Board's distribution systems within the strict.

strict.

Salary N.J.B. Class H, Grade I, £1,600/15/£1,705 per annum.

Applications, giving full details of age, qualiations and experience, together with the names two referees, should be forwarded to the anager, No. 7 (Grimsby) Suo-Area, Yorkshire ectricity Board, Moss Road, Grimsby, not er than 3rd June, 1960.

#### No. 2 (Huddersfield) Sub-Area

COND ASSISTANT
COMMERCIAL ENGINEER
(Commercial, Agricultural and Industrial Development).

Industrial Development).

Applicants should be engineers preferably th Corporate Membership of the Institution Electrical Engineers. The duties comprise sponsibility to the Sub-Area Commercial ficer for a subsection which is to be formed deal with the development of load in compricial, industrial and agricultural premises, define the appointment calls for considerable tiative to interpret and pursue an energetic es policy within these limits. Specifically, perience in space heating, process heating, memercial catering, commercial and industrial ter heating and utilisation of electricity for incultural and horticultural purposes is quired.

quired. Salary N.J.B. Class L, Grade 7, £1,270/£30/

Against N.J.D. Class L. Grade 7, £1,270/£50/ ,360 per annum. Applications, giving full details of age, quali-ations and experience, together with the names two referees, should be forwarded to the anager, No. 2 (Huddersfield) Sub-Area, York-ire Electricity Board, Market Street, Hudders-ld, not later than 3rd June, 1960. 4546

#### MERSEYSIDE AND NORTH WALES **ELECTRICITY BOARD**

A SSISTANT CONSUMERS' ENGINEER

(2) required in the Warrington District of
the Board's No. 2 Sub-Area. Salary within
range £610/£655 per annum (N.J.B. G/14).

Duties will include estimating for contracting
work, and advising consumers on matters relating to electricity supply and the utilisation
of electrical equipment. A technical qualification is desirable.

Appointment subject to medical examination.

Appointment subject to medical examination.

Pension scheme.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date, 30th May, 4549

Denking and Epsom District. Salary £640 × £20 to £700 per annum under N.J.C. Grade 2. Superannuable.

The person appointed will be required to give advice on supply matters, tariffs and appliance sales and installations for domestic and small commercial consumers. Applicants must be thoroughly conversant with all types of domestic electrical appliances and, in addition to acting as an outside representative, must be prepared to carry out general showroom duties in any showroom within the Dorking and Epsom District.

Applications, quoting ER, and naming two referees, on forms from District Manager, SEEBOARD, 56, South Street, Dorking, by 1st June, 1960.

DISTRICT SENIOR COMMERCIAL ASSISTANT (Sales), Worthing District. Salary £980-£1,055 per annum maximum on N.J.C. 6. Superannuable.

The successful applicant will be responsible for sales promotion and publicity and the coordination of the four showrooms in the District. His duties will also include the control of showroom stock.

Applications, quoting ER, and naming two referees, to District Manager, SEEBOARD, 56, Chapel Road, Worthing, by 1st June, 1960.

GEORGE WRAY,
Secretary. 4544

SOUTH EASTERN ELECTRICITY BOARD

SENIOR SALES REPRESENTATIVE,

Secretary.

#### ELECTRICAL DRAUGHTSMEN

DRAUGHTSMEN having experience of circuit design of control systems are required to assist in the design of temperature control panels. Some experience of sheet metal fabrication is also desirable.

Apply, giving details of experience, to the Personnel Manager,

#### THE RHEOSTATIC CO. LTD.

SLOUGH, BUCKS

4505

#### SALES MANAGER, ELECTRICAL DISTRIBUTORS

SALES MANAGER required by old-established wholesale electrical distributors. Only those with considerable and varied experience in the electrical industry should apply. A really first-class opportunity for the successful applicant who must have drive and initiative, be capable of taking full control of the sales staff, and be able to considerably augment sales of the company.

All applications will be treated in the strictest of confidence and should be addressed to the Managing Director, Wilec Ltd., Wilec House, 90/96, City Road, London, E.C.I. 4506

Situations Vacant (continued)

#### CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

A PPLICATIONS are invited for the following positions within the Division:—

THIRD ASSISTANT ENGINEER

THIRD ASSISTANT ENGINEER
(System Planning)
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
(Vacancy No. 109/60)
Applicants should preferably hold an Electrical Engineering Degree or have attained the Higher National Certificate standard in Electrical Engineering. Preference will be given to candidates who have experience of fault calculations and of switchgear and protective gear systems.

systems.

Duties will include power system calculations, relay settings, preparation of system diagrams and operation of D.C. and A.C. calculators.

The salary will be in accordance with Class AX/EX, Grade 6 (£925-£1,170 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 27th

ASSISTANT ENGINEER (Instruments)
HIGH MARNHAM POWER STATION

HIGH MARNHAM POWER STATION
(Vacancy No. 111/60)
Applicants should possess a sound technical training and have practical experience of modern power station instrumentation and automatic control. Experience of electronic equipment will be a distinct advantage.

The salary will be in accordance with Class M, Grade 10 (£1,095-£1,170 per annum) of the National Joint Board agreement.
Closing date for receipt of applications, 27th May, 1060.

GENERAL ASSISTANT ENGINEERS
HIGH MARNHAM POWER STATION
(Vacancy No. 112/60)
Applicants should hold the Ordinary National
Certificate in Mechanical or Electrical Engineering. There are good opportunities for keen
engineers who are willing to study new plant
and methods.
The salary during the initial training period

The salary during the initial training period The salary during the initial training period will depend upon qualifications and knowledge and will be within the range £560-£700 per annum of the National Joint Board agreement.

Closing date for receipt of applications, 27th

PLANT SHIFT CONTROL ENGINEER
DRAKELOW A POWER STATION
(Vacancy No. 117/60)
Experience desirable in control of boilers and

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience. Technical qualifications to Higher National Standard desirable.

Salary will be in accordance with Class J, Grade 10 (£910-£955 per annum) of the National Joint Board agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications 27th

Closing date for receipt of applications, 27th May, 1960.

May, 1960.

ASSISTANT SHIFT CHARGE
ENGINEER,
COVENTRY POWER STATION
(Vacancy No. 118/60).

Applicants are required to take charge of shift operation of boiler house plant and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of fuels and chain grate stokers.

Salary will be in accordance with Class G, Grade 9 (£860-£905 per annum) of the National Joint Board Agreement, plus shift enhancement.

Closing date for receipt of applications, 3rd June, 1960.

June, 1960.

MAINTENANCE SUPERINTENDENT,
CASTLE DONINGTON
POWER STATION
(Vacancy No. 114/60).

Applicants must have had considerable experience of both mechanical and electrical maintenance in a large power station of advanced design. Technical qualifications to Higher National Certificate standard or equivalent. Corporate membership of one of the senior engineering institutions an advantage.

Experience in budgetary control, maintenance planning, costing and plant records desirable.

The salary will be within Class L, Grade 4 (£1,600-£1,705 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 3rd

June, 1960.

ASSISTANT MAINTENANCE
ENGINEER (Mechanical),
CASTLE DONINGTON
POWER STATION
(Vacancy No. 115/60).

Applicants must have had considerable experience in the mechanical maintenance of large modern power stations. Technical qualifications to Higher National Certificate standard in mechanical engineering or equivalent. Experience in costing, planning and plant records desirable.

The salary will be in accordance with Class L, Grade 6 (£1,360-£1,450 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 3rd

June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller

12th May, 1960.

#### UNIVERSITY OF ABERDEEN AND ROBERT GORDON'S COLLEGES

PPLICATIONS are invited for the follow-

ing posts:—
UNIVERSITY LECTURER IN
MECHANICAL ENGINEERING.
Candidates should have special qualifications in applied thermodynamics. An interest in heat transfer apparatus, or in the special problems associated with the generation of heat and power from nuclear reactors, and some industrial or research experience, would be an advantage.

UNIVERSITY LECTURER IN ELECTRICAL ENGINEERING.

Excellent facilities for research or advanced studies. University regulations permit members of teaching staff to read for degree of Ph.D.

Salary on scale rising to £1,850 with placing according to qualifications and experience; superannuation (F.S.S.U.), children's allowance and removal allowance. University houses

superannuation (F.S.S.U.), children's allowance and removal allowance. University houses available from time to time.

Further information may be obtained from the Secretary, The University, Aberdeen, with whom applications (20 copies), giving names of three referees, should be lodged not later than 3rd June, 1960. Applicants outside the British Isles may submit one copy of application.

#### MIDLANDS ELECTRICITY BOARD

PPLICATIONS are invited for the following superannuable posts:-

Birmingham and District Sub-Area DISTRICT COMMERCIAL ENGINEER (South East District).

(South East District).

Duties will include advice on utilisation, negotiations with consumers for supplies of electricity, preparation of estimates, etc., supervision of contracting work, service centres and consumer service. Applicants should have had a sound technical training and wide practical experience of industrial, commercial and domestic installations and their electrical requirements. Technical qualifications desirable. Salary £1,470/£1,575 per annum (N.J.B. Grade 3, Class J).

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (North West District).

Duties will include advice on utilisation, negotiations with consumers for supplies of electricity, preparation of estimates, etc., supervision of contracting work and consumer service. Applicants should have had a sound technical training and wide practical experience of industrial, commercial and domestic installations and their electrical requirements. Technical qualifications an advantage. Salary £1,195/£1,270 per annum (N.J.B. Grade J.6).

Apply by letter, within 7 days, stating age, experience, qualifications, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4. Duties will include advice on utilisation,

Birmingham, 4.

Worcester and District Sub-Area

THIRD ASSISTANT ENGINEER (Substation Construction Section) (Headquarters).

The successful applicant will be required to assist in the construction of primary substations operating at 66 and 33 kV. Previous experience and technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade K.10).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 52, Blackpole Road, Worcester.

SENIOR DRAUGHTSMAN (Redditch/Bromsgrove District).

(Redditch/Bromsgrove District). The successful applicant will be required to take charge of the drawing office. Applicants should have had a sound technical education and experience in the preparation of engineering drawings, substation design and layout plans, keeping of permanent mains records and general drawing office routine. Salary £790/£890 per annum (N.J.B. Grade 5, Schedule D).

Apply by letter, within 14 days, stating age, experience, present position and salary to District Manager, Midlands Electricity Board, Windsor Road, Redditch.

F. W. CATER, Secretary. 4513

## DEVELOPMENT ENGINEER

required for interesting and varied work on design and development of electro-mechanical devices, including solenoids and relays for use on automobiles. Higher National Certificate essential and preferably experience in the development of products for quantity production.

The post is permanent and pensionable and a good starting salary will be paid. Five-day week. Apply in writing, stating age, qualifications and experience to:

THE PERSONNEL MANAGER JOSEPH LUCAS (ELECTRICAL) LIMITED GREAT KING STREET, BIRMINGHAM 19

quoting reference PM/D/454

#### EASTERN ELECTRICITY BOARD

PPLICATIONS are invited for the follow-ing appointments. The successful candi-ates will be required to contribute to a super-invarion scheme and may be required to indergo a medical examination.

Chitterns Sub-Area

NORTHWOOD DISTRICT
OURTH ASSISTANT ENGINEER
(115/60.R).
Candidates should have had a sound technical aining and experience in the construction, peration and maintenance of H.V. and L.V. aderground systems, including substations.
Salary N.J.B. Class F, Grade II (£710-£755), us London weighting.
Apply by letter to the Manager, Northwood istrict, Eastern Electricity Board, 1, Love ane, Pinner, by 3rd June, 1960.

ESSEX Sub-Area

Essex Sub-Area
SUB-AREA HEADQUARTERS
HIRD ASSISTANT ENGINEER
(Planning and Development) (116/60.N).
Candidates should have had a sound technical aining and suitable experience in the design and layout of indoor and outdoor substations and of overhead and underground systems up to 8 kV. They should preferably be Graduate lembers of the Institution of Electrical Engineers.

Salary N.J.B. Class L, Grade 10 (£1,025-1,085), plus London allowance.

Jo85), plus London allowance.

OURTH ASSISTANT ENGINEER

(Planning and Development) (117/60.R).

Candidates should have had a sound technical aining, possess the Higher National Certificate, and have had suitable experience in the design and layout of indoor and outdoor substations and overhead and underground systems.

Salary N.J.B. Class L, Grade 13 (£860-£905), us London allowance.

For these appointments apply by letter to M. Holland, M.I.E.E., A.M.B.I.M., Engineer, Essex Sub-Area, Eastern Electricity Board, iillfield, Bentley, Near Brentwood, Essex, by dd June, 1960.

d June, 1960.

THURROCK DISTRICT
HIRD ASSISTANT ENGINEER
(118/60.N).
Candidates should have had a sound technical aining and suitable experience in the constructor, operation and maintenance of H.V. and W. overhead and underground systems, inuding substations.
Salary N.J.B. Class G, Grade 9 (£860-£905), us £50 London allowance.
Applications by letter, stating age, education, nalifications and experience, should be Idressed to H. J. Unwin, A.M.I.E.E., Manager, hurrock District, Eastern Electricity Board, aidstone Road, Grays, Essex, by 3rd June, 260.

Applications submitted for vacancy number 1/60.N will be reconsidered and the applicants ed not re-apply.

Norfolk Sub-Area

Norfolk Sub-Area
ING'S LYNN AND WESTERN DISTRICT
IRST ASSISTANT DISTRICT
COMMERCIAL ENGINEER (120/60.N).
Applicants should have wide knowledge of commercial aspects and, in particular, excience in industrial and other large power pplies and their appropriate negotiations. he successful applicant will be required to eal with special tariff negotiations and will be sponsible to the District Commercial Engineer reneral assistance in the administration of e District Commercial Organisation, with ecial responsibility for technical work. Excience in control of staff would therefore be added advantage.

Salary N.J.B. Class F, Grade 6 (£965-1,025).

Apply by letter to the Manager, King's Lynn d Western District, Eastern Electricity Dard, Gaywood Bridge, Wootton Road, King's ynn, by 3rd June, 1960.

COND ASSISTANT ENGINEER
(119/60.R).
Applicants should have had a sound technical sining and considerable experience in the mstruction, operation and maintenance of erhead and underground distribution systems cluding substations) at voltages up to and cluding 33 kV.
Salary N.J.B. Class F, Grade 7 (£910-£955).
Apply by letter to the Manager, King's Lynn d Western District, Eastern Electricity

Board, Gaywood Bridge, Wootton Road, King's Lynn, by 3rd June, 1960.

Suffolk Sub-Area

BURY ST. EDMUNDS DISTRICT
THIRD ASSISTANT ENGINEER
(121/60.R).
Candidates should have had a sound technical training and suitable engineering experience to assist in the planning, operation and maintenance (including preventive maintenance) of H.V. and L.V. overhead and underground systems at voltages up to and including 33 kV.
Salary N.J.B. Class F, Grade 9 (£815-£860).
The successful candidate will be required to reside within reasonable proximity of Bury St. Edmunds.

Edmunds.

Apply by letter to H. B. Rendle, A.M.I.E.E.,
Manager, Bury St. Edmunds District, Eastern
Electricity Board, 4, Cornhill, Bury St.
Edmunds, Suffolk, by 3rd June, 1960.
Applications submitted for vacancy 60/60.R
will be reconsidered and these applicants need
not re-apply.

4558

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

(Vacancy No. 131/ER/60)

A PPLICATIONS are invited for the superannuable N.J.B. appointments of SHIFT
CHARGE ENGINEERS at USKMOUTH
"B" POWER STATION, WEST NASH,
NR. NEWPORT, MON.
Salary K.6, £1,270-£1,360 per annum.
Applicants should possess H.N.C. or equivalent qualifications and have had operating
experience in a modern power station.
Special application forms obtainable from
Secretary, South Wales Division, Central
Electricity Generating Board, Twyn-y-fedwen
Road, Gabalfa, Cardiff, to be returned by 3rd
June, 1960.



#### ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

RADUATES IN ELECTRICAL ENGINEERING or PHYSICS or holders of the H.N.C. in Electrical Engineering are required in a HIGH-VOLTAGE RESEARCH LABORATORY for experimental research on HIGH-VOLTAGE PROBLEMS. The work covers a wide range and includes the construction and use of impulse voltage and impulse current generators, high direct voltage generators, and electronic equipment.

Applicants should be able to carry out investigations without close supervision.

Previous works training and laboratory experience are desirable but not essential.

The appointments are permanent and pensionable; the starting salary will be in accordance with qualifications and experience.

Please write quoting reference L.15 for application form to:-

Personnel Manager

ASSOCIATED ELECTRICAL INDUSTRIES (MANCHESTER) LTD. Trafford Park Manchester, 17

4480

#### SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

Second Assistant District Engineer (Hamilton District)

A PPLICATIONS are invited for the above appointment. Applicants should have had a sound engineering and technical training. They should have had subsequent experience with the maintenance and operation of H.V. and L.V. overhead and underground networks and substations on a large distribution system. They should also be conversant with load flow diagrams, voltage drop and short circuit calculations and should have had experience with H.V. fault location.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, Schedule A, the present classification and grading being F.7, salary £910/£95 per annum. The post will be superannuable. Application forms, which may be obtained from the undersigned, should be returned to this office within fourteen days of the date of this advertisement.

R. J. RENNIE,

R. J. RENNIE, Manager.

Montrose Crescent, Hamilton.

4512

#### J. LYONS & CO. LTD. Ice Cream Division

require SENIOR ELECTRICAL DESIGN DRAUGHTSMEN; must have Higher National Certificate and be fully experienced in all branches of industrial automation and sequence and process control operations.

Write stating age and experience to Personnel Manager, J. Lyons & Co. Ltd., Works Department, 143, Hammersmith Road, London, W.14.

#### COUNTY COUNCIL OF NORTHUMBERLAND

**County Architect's Department** 

A PPLICATIONS are invited for the appointment of ASSISTANT ELECTRICAL ENGINEER on the permanent staff of the department. Salary on A.P.T. Grade III Scale £880-£1,065 per annum according to age and experience.

Applicants should have experience of lighting and power installations in schools and other local authority buildings and must be able to prepage working drawings.

and power instantional local authority buildings and must be able to prepare working drawings.

Applications giving full details of age, education, qualifications and previous experience together with the names of two referees to whom reference can be made to be submitted not later than Monday, 13th June, 1960.

The appointment will be subject to the provisions of the Local Government Superannuation Acts and the successful candidate will be required to pass a medical examination.

C. C. BROWN, A.R.I.B.A.,
County Hall,

#### TRANSFORMER AND POWER CAPACITOR ENGINEERS

wanted for Sales and Contracts office. Preference given to candidates with H.N.C. or studying for this.

Apply:-

Sales Director

BRYCE ELECTRIC CONSTRUCTION CO. LTD.

Kelvin Works, Hackbridge, Surrey
4465

#### Situations Vacant (continued)

#### AIR MINISTRY

STATION ENGINEERS (G.D.) and STA-TION ENGINEERS (Mech.) required at R.A.F. and Ministry of Aviation Stations. The work of Station Engineers (G.D.) consists of installation, operation and maintenance of high work of Station Engineers (c.D.) consists of installation, operation and maintenance of high and medium-voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage. Station Engineers (Mech.) are concerned with diesel power plant, steam and hot water heating systems, refrigeration and air conditioning and miscellaneous workshop plant, tools and equipment.

Candidates must hold O.N.C. Elec. or Mech./ City and Guilds Electrical Technicians Certificates/ 2nd Class M.O.T. Certificate or equivalent, and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidate with supervisory experience.

Salary ranges from £680 to £785 rising by

supervisory experience.

Salary ranges from £680 to £785 rising by annual increments to £850. Commencing salary dependent upon age, qualifications and experience.

Opportunities for promotion up to Tech. Grade A, maximum salary £1,565 (national rate). Pension prospects. 5-day week. 18 days' paid leave a year initially. Internal training courses are provided and attendance at technical colleges by suitable candidates is sponsored. Overseas tours for which special allowances are payable in addition to higher salary.

allowances are payable in a salary.

Applicants, who must be natural-born British subjects, up to age 35, should write stating age, qualifications and experience to Manager (P.E.1), Ministry of Labour, P. & E. Register, Arlantic House, Farringdon Street, London, E.C.4. No original testimonials should be sent. Only applicants selected for interview will be advised.

266

#### OXFORDSHIRE EDUCATION COMMITTEE

## North Oxfordshire Technical College and School of Art Principal: N. A. Pratt, A.T.D.

Principal: N. A. Pratt, A.T.D.

A PPLICATIONS are invited from suitably qualified persons for the following appointment as ASSISTANT GRADE "A" in the Department of Building and Engineering, to commence as soon as possible.

The person appointed will be required to teach all subjects in the City and Guilds Electrical Installation Work Course B, and also take Calculations, Science and Engineering Drawing in the In roductory Engineering Courses.

Application forms obtainable from the Principal, 51, The Green, Banbury, to whom completed applications should be returned within 14 days.

14 days.

County Offices,

A. R. CHORLTON, Director of Education

#### SALES ENGINEERS

#### HEAVY ELECTRICAL PLANT AND RECTIFIERS 'ENGLISH ELECTRIC.' STAFFORD

A PPLICATIONS are invited from Electrical Engineers interested in sales work associated with the supply of heavy electrical machines, transformers, rectifiers and their associated control equipment to heavy industry.

The posts are located in technical offices at our Stafford Works dealing with customer liaison, involving correspondence and personal contact as well as the compilation of tenders and estimates.

These openings offer an opportunity to gain valuable experience of up-to-date techniques in the field of heavy industrial applications as well as offering a secure and promising career in a stable industry.

Applicants should possess H.N.C. (E).

Assistance with accommodation will be discussed at interview.

Membership of the staff pension scheme and eligibility for three weeks' holiday follow a qualifying period of service.

If you would like to visit Stafford to discuss these openings, please write giving full details to Dept. C.P.S., Marconi House, 366/7, Strand, London, W.C.2, quoting reference ER.1297J.

4520

#### CENTRAL ELECTRICITY GENERATING BOARD

#### Eastern Division

A PPLICATIONS are invited for the follow-

GENERAL ASSISTANT ENGINEERS, LITTLE BARFORD GENERATING STATION (St. Neots, Hunts).

Salary N.J.B. Class J, within the range of Grades 16/14, £610 × £15 to £755 per annum plus £90 shift allowance.

The commencing salary will depend upon the duties and responsibilities.

Duties of the above posts include assisting in the electrical control room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a generating station, and provide a suitable basis for promotion to higher technical grades. grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be

of advantage.

Applications, quoting Staff Vacancy No. 1318, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 28th May, 1960.

#### AIR MINISTRY

A SSISTANT MECHANICAL and ELEC-A TRICAL ENGINEERS required for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil

home and overseas as well as certain Civil Airports.

Salary £805 at 25 to £1,095 at 34 or over, thereafter rising to maximum £1,260, with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. 5-day week with 4 weeks 2 days leave a year initially. Special allowance in addition to salary during overseas service.

Qualifications and experience:—

(i) (a) University Degree or equivalent diploma in electrical and/or mech-anical engineering with at least 2 years' apprenticeship; or

(b) Graduate or Corporate Member of I.E.E. with at least 3 years' appren-

ticeship; or
(c) Graduate or Corporate Member of
I.Mech.E., appreciable electrical
engineering experience with at least
3 years' apprenticeship; and

(ii) Have been employed for minimum of 2 years with well-established engi-neering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural-born British sub-

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.158/OA. 257

#### NORTHAMPTONSHIRE **EDUCATION COMMITTEE**

#### Corby Technical College

REQUIRED for September, 1960, an ASSISTANT GRADE B to teach ELECTRICAL INSTALLATION and NATIONAL CERTIFICATE ELECTRICAL ENGINEER-ING. A knowledge of Radio or Electronics will be an advantage. Salary in accordance with the Burnham Technical Report, £700 to £1,150 per annum plus, as appropriate, graduate addition (£90 per annum), good honours degree addition (£75 per annum), training addition; incremental allowance within scale for approved industrial experience. industrial experience.

Whilst no promise can be given, Corby Development Corporation have always given preference to teachers regarding housing.

Apply immediately (no forms), and in any case by 27th May, 1960, stating names, status and addresses of two referees, to the undersioned. signed.

G. E. CHURCHILL, Chief Education Officer.

County Education Offices, Northampton.

#### SENIOR TRANSFORMER DESIGNERS

THE GENERAL ELECTRIC COMPANY LIMITED has vacancies for Engineers experienced in the design of all classes of power transformers, including distribution transformers, rectifier transformers and high-voltage power transformers up to the largest types.

Applicants should possess a Degree in Electrical Engineering or at least Higher National Certificate with a minimum of 5 years' experience in design work.

The company operates contributory sick and superannuation funds and assistance will be given with removal expenses.

Please apply in writing, stating qualifications and experience, to the

Staff Manager

#### THE GENERAL ELECTRIC CO. LTD.

Witton, Birmingham, 6

4521

4534



#### ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

A PPLICATIONS are invited for appointments as SALES ENGINEERS at the Willesden, London, factory of the A.E.I. Switchgear Division.

The work, involving the preparation of tenders and the handling of contracts for a wide range of heavy switchgear, is interesting and calls for commonsense and initiative. Good salaries are available to men preferably between 25 and 45 years of age.

The desired qualification is an engineering degree, but men qualified in electrical engineering to at least H.N.C. standard will be considered. Applications should be addressed to:-

> Mr. P. E. Gaze, Sales Manager Switchgear Sales Department ASSOCIATED ELECTRICAL INDUSTRIES LTD. Neasden Lane, Willesden, London, N.W.10

> > 4417

#### FEDERATION OF RHODESIA AND NYASALAND

Federal Power Board

Appointment of Assistant Civil Engineer

THE FEDERAL POWER BOARD invites applications for the post of ASSISTANT CIVIL ENGINEER at its Head Office in Salisbury.

The person appointed will be required to carry out administrative engineering duties in connection with the development of electricity supplies in the Federation, and particularly in connection with hydro-electric projects. He may also be required to work in the field periodically.

Candidates should preferably be Chartered Civil Engineers or should be in a position to sit their final professional examinations. A knowledge of water engineering generally and experience in the supervision of heavy civil engineering contracts would be of advantage.

The appointment will be to the Board's permanent staff, after a probationary period, and the successful candidate will be required to become a contributor to the Board's pension fund.

Salary about £1,750 per annum.

Applications, giving full details of age, experience and qualifications, should be posted so as to reach the Secretary, Federal Power Board, Reliance House, P.O. Box 630, Salisbury, S. Rhodesia, not later than 4th June, 1960.

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

Third Assistant District Engineers, Edinburgh District (Salary N.J.B. Schedule A, Class G, Grade 9, £860/£905 p.a.)

A PPLICATIONS are invited to fill engineering vacancies in the three Edinburgh Districts.

Districts.

Applicants should have a sound training and subsequent experience with H.V. and L.V. underground distribution systems, including the operation and maintenance of H.V. and L.V. switchgear and a knowledge of protective gear and fault location. They should also possess a National Certificate of Electrical Engineering or an equivalent qualification.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The successful candidates, subject to satisfactory evidence of health, will require to become contributors to the Board's Superannuation Scheme.

In each case the successful candidate will require to reside within a reasonable distance of the District office.

Applications, on the standard form obtainable from the undersigned or any other Area Manager, should be submitted not later than 3rd June, 1960.

C. H. C. COLLYNS,

Manager. 4516

C. H. C. COLLYNS, Manager. 4516

#### NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

A PPLICATIONS are invited for the following appointments:—

FIRST ASSISTANT DISTRICT
ENGINEER, DURHAM DISTRICT.
Salary Schedule A, Class F, Grade 4,
£1,095/£1,170 per annum. N.J.B. conditions

SECOND ASSISTANT DISTRICT ENGINEER, CHESTER-LE-STREET DISTRICT.

Salary Schedule A, Class F, Grade 7, £910/£955 per annum. N.J.B. conditions

£910/£955 per annum. N.J.B. conditions of service.

It is anticipated that these District will be reclassified Class G.

Applicants should have had sound training and experience in construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and auxiliary equipment. Preference will be given to candidates with qualifications leading to Corporate Membership of I.E.E.

If application has already been made to previous advertisement it is not necessary to re-apply.

previous advertisement it is not necessary to re-apply.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement.

4517

#### HENDREY RELAYS LIMITED 392, Bath Road, Slough, Bucks

SALES ENGINEER with experience in the D preparation of estimates and tenders for light electro-mechanical instruments and devices required immediately.

Good conditions, 5-day week. Contributory

pension scheme.

Apply in writing giving age, details of training and experience and salary required to the General Manager.

4504

#### FEDERATION OF RHODESIA AND NYASALAND

Federal Power Board

Appointment of Senior Assistant Civil Engineer

THE FEDERAL POWER BOARD invites

applications for the post of SENIOR ASSISTANT CIVIL ENGINEER at its Head Office in Salisbury.

The person appointed will be required to carry out administrative engineering duties in connection with the development of electricity supplies in the Federation, and particularly in connection with hydroglettic receipts.

supplies in the Federation, and particularly in connection with hydro-electric projects.

Candidates must be Chartered Civil Engineers and should have knowledge and experience of the development and administration of major civil engineering projects, preferably in the hydro-electric field.

The appointment will be to the Board's permanent staff, after a probationary period, and the successful candidate will be required to become a contributor to the Board's pension fund.

Salary about £2,200 per annum.

Applications, giving full details of age, experience and qualifications, should be posted so as to reach the Secretary, Federal Power Board, Reliance House, P.O. Box 630, Salisbury, S. Rhodesia, not later than 4th June, 1960.

#### POWER STATION CHEMIST ELECTRICITY DEPARTMENT CAPE TOWN, SOUTH AFRICA

A VACANCY exists in the Generation Branch of the Electricity Department of the City Council of Cape Town, South Africa, for a suitably qualified person for the position of POWER STATION CHEMIST.

The scale of pay (total emoluments) applicable to the post is £1,560 with two increments of £60 to a maximum of £1,680 per annum.

Applicants must possess a degree in Chemistry of a recognised university or an equivalent qualification. They must have had experience in a power station laboratory and be familiar with the methods of sampling and analysis of materials used in a power station, preferably with advanced steam conditions. A knowledge of nuclear physics and the use of radio-active isotopes will be an advantage.

Persons possessing the requisite qualifications and experience are invited to apply not later than MONDAY, 23rd MAY, 1960, and to address their applications to:—

Messrs. Merz and McLellan Carliol House Newcastle upon Tyne England

from whom further particulars relating to the vacant position may be obtained. 4287

#### HATFIELD TECHNICAL COLLEGE Hatfield, Herts

ELECTRICIAN required for installation and maintenance work. Must be first-class tradesman. Usual local government conditions of service. Wage £11 11s. 11d. for 44-hour

Apply Registrar, Hatfield Technical College, Hatfield, Herts. 4488

#### H. CLARKE & COMPANY (Manchester) LIMITED

ELECTRICAL INSULATION MANUFACTURERS

#### SALES REPRESENTATIVE

required for Scotland.

The position is permanent and offers excellent opportunities for an enthusiastic man. Knowledge of the electrical insulation industry and materials desirable although not

All applications, which will be treated in strictest confidence, should give full particulars of previous experience, and should be addressed to:—

The Sales Manager Atlas Works, Patricroft, Manchester

AAII

Situations Vacant (continued)

#### CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

SENIOR ASSISTANT ENGINEER (Vacancy SENIOR ASSISTANT ENGINEER (Vacancy No. 116/60) required to take charge of the District of the Divisional Electrical Engineer's Department based at Northfleet Power Station. The successful candidate will be responsible for the administration of all construction, operation and maintenance work within the District.

Applicants should be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualification. They must have had extensive experience in the construction and maintenance of 132-kV (and preferably 275-kV) transmission equipment.

Experience of joint consultation and negotiating machinery would be advantageous and evidence must be produced of administrative ability.

ability

ability.

Salary Class AX/DX, Grade 3, £1,415-£1,655 per annum including London allowance. Applications, giving details of education, qualifications, present position, experience, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-on-Thames, Surrey, to arrive by 31st May, 1060.

W. H. DUNKLEY, Divisional Controller.

#### CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

Third Assistant Engineer (Mechanical)

A PPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Mechanical) at Uskmouth "B" Power Station

Applicants should have had a fundamental Applicants should have had a fundamental training in mechanical engineering, including workshops, and should preferably have experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern power stations. Appropriate technical qualifications will be an advantage. The salary will be in accordance with Schedule C, Grade 5 (£1,090 - £1,300 per annum).

Applications should be made on standard form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, 341, Bournville Lane, Birmingham, and should be returned to him not later than 1st June,

Envelopes should be marked "Confidential, Staff Vacancy Notice No. MPG.35/60." 4489

#### CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

Draughtsmen (Mechanical and Electrical)

A PPLICATIONS are invited for the appointments of DRAUGHTSMEN (Mechanical) and Electrical) in the Midlands Project Group

and Electrical) in the Midlands Project Group at Bournville.

Applicants should have a sound technical and practical training in mechanical or electrical engineering, together with drawing office experience of the layout of power station or other heavy industrial plant.

The possession of an appropriate H.N.C. or O.N.C. would be an advantage.

The salary for the posts will be in accordance with Grade 5 (£790 - £890 per annum) and Grade 6 (£620-£740 per annum).

Applications should be made on form AE.6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham, and should be returned to him not later than 30th May, 1960.

Envelopes should be marked "Confidential, Vacancy No. MPG.38/60."

WANTED IN LANCASHIRE

#### WANTED IN LANCASHIRE

ENGINEER - REPRESENTATIVE with good general engineering knowledge, especially electrical plant and pumps. Write stating qualifications and experience to:—

THOMAS MITCHELL & SONS LTD. Bolton

#### SOUTH WALES ELECTRICITY BOARD

Commercial Assistant

A PPLICATIONS are invited for the position of COMMERCIAL ASSISTANT in the Llanelly District of the Swansea and West Central Area of the Board.

Preference will be given to candidates possessing a Higher National Certificate in Electrical Engineering or an equivalent quali-

fication.

The salary for the position will be in accordance with Class F, Grade 7 (£910/£955) of the National Joint Board Agreement for the Electricity Supply Industry. At the present rate of progress there are prospects that the classification of this District will be Class G in the not too distant future.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.Sc., M.I.E.E., M.Am.I.E.E., Manager, Swansea and West Central Area, 29, Ystrad Road, Swansea Industrial Estate, Swansea, Glam., so as to reach him not later than Tuesday, 31st May, 1960.

Envelopes should be endorsed "Commercial

Assistant, 93/60.

R. G. WILLIAMS, 4482 Secretary.

#### LONDON ELECTRICITY BOARD

#### Demonstrator

A PPLICATIONS are invited for the above position in the Board's North Western District. Initially the successful candidate will be based at Willesden Lane, London, N.W.2, but may be required to work at any showroom within the District.

within the District.

Applicants should be suitably qualified, holding the E.A.W. or other approved certificate, including Electrical Housecraft, and have experience in conducting demonstrations at showrooms and general showroom duties. They should also be experienced in advising consumers on the selection and use of domestic appliances, both at the showroom and on consumers' premises.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 1, i.e., £525 to £625 per annum, plus the appropriate London Area allowance.

allowance

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/V/2871/R. 4519

#### CENTRAL ELECTRICITY GENERATING BOARD

#### Midlands Division

YENERAL ASSISTANT ENGINEERS are GENERAL ASSISTANT Extension for required at Ironbridge Power Station for operational duties. N.J.B. service

required at Ironbridge Power Station for generation operational duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, J.14, £710-£755 p.a.

Applicants should have received a sound technical training and preferably have had some industrial engineering experience, and have as a minimum qualification the Ordinary National)

Apply, quoting Vacancy No. 105/60MD, on forms AE6, which are available from the Station Superintendent, Ironbridge Power Station, Buildwas, Salop, to whom they should be returned when completed not later than 27th May, 1960.

#### RELIANCE CORDS & CABLES LTD.

#### SENIOR INSPECTORS

for Cable Factory, London District, manufacturing rubber and plastic cable principally for the telecommunications industry, with possibilities of early promotion. Experience of Government inspection procedures preferable.

#### **TECHNOLOGIST**

with experience in the handling and testing of materials for the foregoing types of cable.

Apply in writing with particulars of previous experience to:—

Chief Engineer

#### RELIANCE CORDS & CABLES LTD. Fingal Works, Staffa Road Leyton, London E.10

when arrangements for an interview will be made.

#### SOUTHERN RHODESIA GOVERNMENT

#### Vacancy: Electrical Engineer

A VACANCY exists in the Southern Rhodesia Department of Engineering and Construction for an ELECTRICAL ENGINEER, to take charge of the installation of rural and urban electrical distribution up to 11 kV, including the preliminary detailed design and layout. He will be based in Salisbury but will be required to work in any part of the Colony. The salary offered is £1,785 × £78 15s. to £1,942 10s. per annum, and the minimum qualification is Graduate of the Institution of Electrical Engineers.

The appointment may lead, within four or VACANCY exists in the Southern Rhodesia

Electrical Engineers.

The appointment may lead, within four or five years' time, to Senior Electrical and Mechanical Engineer of the Department. For this the minimum qualification will be Associate of the Institution of Electrical Engineers.

Application forms and further details from the Secretary (R), Rhodesia House, 429, Strand, London, W.C.2. Closing date 15th June, 1960.

#### BOROUGH OF POOLE

#### Electrical Engineering Assistant Grade III (£880-£1,065)

A PPLICATIONS for the above post are invited from properly trained electrical engineers of not less than Higher National Certificate standard.

Applicants must have had design and esti-

Applicants must have had design and estimating experience as consumers' or contracts engineers, and be capable of supervising works on contract sites. The work will be related to the internal and external engineering and architectural branches, and some knowledge of street lighting would be an asset.

Application forms and details of the appointment are available from the Borough Engineer, Municipal Buildings, Poole, Dorset, and must be returned to the undersigned not later than Saturday, 28th May, 1960.

J. G. HILLIER,
Town Clerk.

Town Clerk

4557

#### MORECAMBE ELECTRICAL EQUIPMENT COMPANY LIMITED

#### SENIOR CONTROL GEAR DESIGN ENGINEER

WE have a vacancy at Morecambe for an Engineer who is experienced in the design of components and accessories for Electric Motor Control Gear.

Experience of modern materials and manufacturing methods is essential, and the appointment carries with it the responsibility for the supervision of testing of prototype designs and completion of production drawings.

The salary would be commensurate with age and experience. Please write with confidential details to the Technical Director.

WESTGATE WORKS, MORECAMBE, LANCASHIRE

#### DRAUGHTSMEN

VACANCIES exist for SENIOR, INTERMEDIATE AND JUNIOR DRAUGHTSMEN with general electrical engineering experience for work

POWER RECTIFIERS AND TRANSFORMERS VARIABLE SPEED DRIVES

Good working conditions. Canteen facilities. Pension scheme. All applications in strictest confidence, quoting ref. W.R.J., to:—

#### LANCASHIRE DYNAMO NEVELIN

Hurst Green, Oxted, Surrey Phone: Oxted 3361

4485

#### NORTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD

40, Eastbourne Terrace, London, W.2

NGINEERS (Electrical). Salary according to age and experience from £950-£1,650. plicants must be Corporate or Graduate embers of the Institution of Electrical Enginers and have passed the Institution's examinous or hold exempting qualifications. The test offer opportunities to cover the whole field electrical engineering in hospitals. ENGINEERING DRAUGHTSMEN. Salary ording to age and experience from £910-300. Applicants should hold the Higher tional Certificate and should have suitable citical and theoretical training including site workshop experience. The posts are pensionable, with good prosents of promotion. Applications giving age, present salary, qualitions and experience (with dates), together hammes of two referees, should be sent the Secretary, North East Metropolitan gional Hospital Board, 40, Eastbourne Tere, London, W.2, within 14 days.

MERSEYSIDE AND NORTH WALES NGINEERS (Electrical). Salary according

#### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ECOND ASSISTANT ENGINEER (Construction) required at No. 2 Sub-Area adquarters, Sandiway House, Northwich,

eshire.

salary within range £1,195/£1,270 per sum (N.J.B. K/7).

Applicants should have considerable experiment the construction of H.V. and M.V. distrinion networks, including substations and ociated equipment at supply points, underland cables and overhead lines. Technical diffications desirable.

Appointment subject to medical examination.

ision scheme.

Application forms obtainable from the mager at the above address. Closing date, h May, 1960.

#### COLONIAL DEVELOPMENT CORPORATION

#### YOUNG QUALIFIED ELECTRICAL ENGINEER

required as Assistant Engineer in wattle extraction factory in Tanganyika, at 5,000 ft. altitude, with very temperate climate. House at nominal rent with ree services; free medical attention and contributory superannuation scheme. Two-year tour followed by three months' eave. Free family passages. Good salary and allowances.

Candidates, age 26-30 years, should apply in writing giving full particulars and experience, and quoting Serial 414,

Personnel Officer 33, Hill Street, London, W.1

4487

#### EAST MIDLANDS ELECTRICITY BOARD

Senior Draughtsman, Derby and Burton Sub-Area (Vacancy No. 54/60)

A PPLICATIONS are invited from suitably qualified and experienced persons for the above position.

A qualified and experienced persons for the above position.

Salary N.J.B. Schedule D, Grade 5, £790 × £20 to £890 per annum.

The successful applicant will be required to take charge of the drawing office and should have experience in the preparation of engineering drawings, substation design, layout plans, keeping of permanent mains records and general drawing office routine.

Applications in writing giving details of age, experience and present position, and quoting the above vacancy number, should be forwarded to the Manager, Derby and Burton Sub-Area, Electricity Offices, Iron Gate, Derby, in a confidential envelope endorsed "Senior Draughtsman," within fourteen days of the date of this advertisement.

#### CITY OF NOTTINGHAM

City Engineer's Department, Assistant Electrical Engineer (Salary £765-£1,065)

A PPLICATIONS are invited for the above position in the City Engineer's Department, Nottingham, in Grade A.P.T. II (£765-£880 p.a.) or A.P.T. III (£880-£1,065 p.a.). Grade and starting salary will depend on quali-

Applicants must have the ability to design electric lighting and power installations for new buildings. The work in the office is on a five-

buildings. The day week basis.

Applications on forms to be obtained from R. M. Finch, O.B.E., M.I.C.E., City Engineer and Surveyor, Guildhall, Nottingham, must be returned to him not later than Friday, 3rd June, 1960.

#### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

A SSISTANT CONTRACTING ENGINEER required in the Liverpool Central
District of the Board's No. 1 Sub-Area.
Salary within range £860/£905 per annum
(N.J.B. Jir.).
Candidates should have had experience of
electrical contracting, including estimating and
supervision of work on site.

Appointment subject to medical examination.

Appointment subject to medical examination.

Pension scheme.

Special application forms, available from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be completed and returned not later than 30th May, 1960.

4547

#### FAWCETT PRESTON & CO. LTD.

FAWCETT PRESTON & CO. LTD.

Bromborough, Cheshire

require a SALES ENGINEER for appointment
to its Electrical Division Outside Sales Staff to
operate in the Midlands and Southern England
from London on Technical Sales duties.

Experience of industrial and traction resistors
and their application is desirable, and preference
will be given to applicants holding H.N.C.
(Elec.) or equivalent.

Apply giving full details and present salary
to General Sales Manager, at Bromborough.

4427

UNIVERSITY OF BRISTOL

A PPLICATIONS are invited for a post as LECTURER IN ELECTRICAL ENGINEERING. Candidates should have high qualifications in electronics and communications.

qualifications in electronics and communications. Salary on the scale £1,050 to £1,850, with initial placing according to age and experience, together with family allowance and superannuation under F.S.S.U.

Applications, giving full details of age and record to date, and the names of two or three referees, should be sent to the Registrar as soon as possible.

#### LIGHTING FITTINGS DESIGN

VERSATILE DESIGNER/DRAUGHTS-MAN with practical knowledge of manufacturing technique required for drawing office in Central London.

Diverse range of industrial, commercial and specialised equipment. Usual large companies' benefits.—Box 4484.

#### ELECTRICAL ENGINEER

A N electrical engineer with H.N.C. is required for varied and interesting work in the Engineering Department of an organisation employing 1,200 people in South West Essex. Commencing salary from £750 p.a. according to age and experience.

Send details of education and career to Box

#### PERSONAL ASSISTANT TO MANAGING DIRECTOR

Outstanding technical and commercial ability are essential for this important post as well as practical experience and knowledge of motor control and low voltage switchgear. Applicants must be qualified and keen to handle and coordinate all types of low voltage switchgear schemes and contracts. Initiative, drive and organising personality is considered of particular importance.

This is a worthwhile exponenturity for

This is a worthwhile opportunity for the right man.

Applications in strictest confidence

The Managing Director ELECTRO MECHANICAL MANUFACTURING CO. LTD.

> Marlborough Street Scarborough

4449

A FOREMAN for electric motor repair shop, experienced in A.C. and D.C. all types. Good opportunity in expanding company. New house available.—Lewis Electric Motors Ltd., Moor Works, Blackamoor Lane, Maidenhead, Parks.

house available.—Lewis Electric Motors Ltd., Moor Works, Blackamoor Lane, Maidenhead, Berks.

A KEEN young contracts engineer is required by progressive concern. Only persons who are interested in advancement need apply. Salary by arrangement.—First Garden City Ltd., Broadway, Letchworth, Herts.

A LARGE British company requires a number of refrigeration service engineers for work in Nigeria and Ghana. They must be widely experienced in the servicing of domestic refrigerators and simple industrial equipment and must be capable of controlling a workshop and supervising and training local mechanics. The initial contract will be for a period of 24 months with the possibility of renewal or transfer to the permanent management staff. Salary approximately £1,300 per annum, with free accommodation plus a gratuity on satisfactory completion of tour. Apply giving full details of age and qualifications to—Box 4523.

A LARGE steelworks in the United Kingdom is desirous of appointing a junior electrical engineer. This post offers excellent opportunities for represention to a keep generactic engineer.

A LARGE steelworks in the United Kingdom is desirous of appointing a junior electrical engineer. This post offers excellent opportunities for promotion to a keen, energetic engineer with a degree or equivalent qualifications. Age preferably under 25. Contributory pension and free life assurance scheme. Please send full details of age, qualifications, experience and salary level expected to—Box 4507.

#### Situations Vacant (continued)

LUMINIUM LABORATORIES Limited A (The Research and Technical Organisation of the International ALCAN Group of Companies) require an experienced graduate engineer to undertake advanced design and development work on electrical machines. Pension and life assurance scheme in operation

development work on electrical machines. Pension and life assurance scheme in operation. Apply to Personnel Officer, Southam Road, Banbury, Oxon.

A N assistant electrical engineer is required by consultants engaged on several large and interesting schemes. Applicants preferably O.N.C. standard and with some practical or installation experience. Please submit details and salary required to—Donald Rudd & Partners, 3/5, Rickmansworth Road, Watford, Herts.

A PPLICATIONS engineer well versed in A electronics, valves and transistors required by electrical control and instrument manufac-

by electrical control and instrument manufacturers in Home Counties. State age and experience.—Box 4492.

A SSISTANT required to assist in estimating, costing and invoicing for contracting. Partime worker would be considered. Experience essential.—Box 4493.

PRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyor required in Scotland. Permanent position carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience.

RYCE ELECTRIC CONSTRUCTION Co.

RYCE ELECTRIC CONSTRUCTION Co.
Ltd. have vacancies for senior and junior

Ltd. have vacancies for senior and junior power capacitor and transformer development engineers. Write Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Surrey, stating age, experience, qualifications, and salary required.

ONSULTING engineers have vacancy for an assistant electrical engineer, preferably Grad. I.E.E., for work of wide variety on power plant, distribution and factory installations, including inspections at works, supervision on site and office work. Non-contributory pension scheme. Apply in writing with brief details, including present salary, to—Messrs. Mackness & Shipley, Abbey Orchard Street, London, S.W.I.

S.W.I. 4494

ONSULTING engineers require intermediate draughtsmen, designers and junior draughtsmen for electrical services in connection with hospitals, university projects and schools. Write—Locke & Beal, 303/307.

Balham High Road, London, S.W.I7. 4495

ONTROL circuit engineer and estimator for automatic motor control gear;
O.N.C. or H.N.C. desirable with previous expenses.

O.N.C. or H.N.C. desirable with previous experience; permanent and pensionable situation. Apply giving details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey.

British Klockner Switchgear Ltd., Chertsey, Surrey.

DEVELOPMENT engineer for work in electric heater development laboratory. Minimum qualification O.N.C. Salary according to ability and experience.—Personnel Officer, E. K. Cole Limited, Malmesbury, Wilts. 4316

DRAUGHTSMAN (junior) electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey.

DRAUGHTSMAN (junior) required in London by control panel manufacturers for circuit and layout drawings. Interesting work with small progressive company offering excellent prospects. Write giving age, experience and present salary in confidence to Managing Director.—Box 7540.

TRAUGHTSMAN required by manufactures and present salary in confidence to Managing Director.—Box 7540.

Managing Director.—Box 7540.

DRAUGHTSMAN required by manufacturers of medium-voltage metalclad switchgear for their contracts drawing office. Bonus and non-contributory superannuation schemes in operation. The company is within six miles of the South Devon Coast, and a house is available for the selected applicant. Write, stating previous experience, age, and salary required, to — Ottermill Switchgear Limited, Ottery St. Mary, Devon.

DEFICIAL PRICES AND ASSESSED AS

Ottery St. Mary, Devon.

LECTRICAL engineer required to take charge of estimating department of large London electrical contractor. Please reply, giving full details, to—Box 4496.

ELECTRICAL design engineer required to work with minimum supervision on interwork with minimum supervision on interesting power and lighting schemes for major building projects. H.N.C. level of ability required. Apply in writing giving full details of age, experience and salary required to—Norman & Dawbarn, Architects & Consulting Engineers, 7, Portland Place, London, W.I. 131

ELECTRICAL familia draughtsmen Electrical industrial and lighting installation design for all types of commercial and industrial buildings. A knowledge of motor control applications an advantage. Please apply giving age, training and experience to—Box 4282

LECTRICAL engineer required for Glasgow minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2.

LECTRICAL maintaneous arminos.

ELECTRICAL maintenance engineer versant all phases of power and lighting illations. Knowledge of telephone wiring installations. Knowledge of telephone wiring and/or hot water heating systems an advantage. Permanent pensionable position in large City (London) office. Age group 28/35. All relevant details to Chief Engineer.—Box 4525.

ELECTRICAL wholesalers require really Country area. Progressive opening for right man. Car provided. Apply with full details of previous experience and salary required to—

E LECTRICIANS, first-class, good technical knowledge, experience installation work. La knowledge, experience installation work. Two years overseas, excellent situation, large electrical concern. Write age, experience, copy references.—Box 4470.

ELECTRICIANS required for power work.

Write—Box 4555.

ELECTRICIANS seeking regular employment required by seeking ment required by small expanding North London contractor. Five-day week.—Box 7538. Endon contractor. Five-day week.—Box 7538.

In NGINEER for inspection of cranes and lifting plant required by leading insurance company. Must have drawing office experience of design of cranes, also National Certificate in Mechanical Engineering. Areas South Essand Liverpool. Starting salary £800; other benefits; not over 38 years; permanent. Write Box ER.417, L.P.E., Romano House, 399/401, Strand, London, W.C.2.

The wholesaler requires experienced.

E.W.F. wholesaler requires experienced representative to cover the Midlands area north of Birmingham. The selected applicant will be considered for promotion to branch manager and only representatives with experience in the electrical trade will be considered. Car provided and high salary envisaged. Reply Reference HBJ.—G. A. Nicholas Ltd., 69, Horseley Heath, Tipton, Staffs.

EXPERIENCED transformer designer reestimating department of factory in N. W. London covering all types of transformers up to 5 kVA. Salary £1,300 p.a. Superannuation scheme. Write stating age, experience, etc.—

Box 4527.

HEATING engineer for leading manufacturers of electric floor warming system.

Grad. I.H.V.E. minimum standard of qualification with experience in heat loss and design calculations. Scope and prospects in expanding organisation for individual with initiative and having electrical bias. Full details stating salary required to—Box 4323.

JUNIOR electrical engineer required to assist in the development and laboratory testing of induction watthour meters and associated test equipment, Minimum educational requirement H.N.C. (Electrical). Write giving full details of experience to the Personnel Manager, Sangamo Weston Ltd., Cambridge Road, Enfield, Middx.

Lifts design and detail draughtsmen offered permanent positions in modern drawing office in Nottingham. Write full details—W. J. Furse & Co. Ltd., Traffic St., Nottingham. 4395

Purse & Co. Ital, France of Action grant. 4393

PRODUCTION progress manager required by light electrical engineering company in S.E. London. Candidates must be experienced in planning of factory loading, control of production and purchasing progress teams. Applications treated in strict confidence. Give full particulars, age and salary required.—Box 4510.

PROGRESSIVE young transformer designer I required by expanding manufacturer in new factory in South Wales. Forward full parti-culars of training and experience.—Box 4528.

REPRESENTATIVE required for Bristol branch of leading electrical wholesalers. Must have existing connections and proved sales record. Excellent opportunity and top salary. Non-contributory pension and life insurance scheme. Write stating age, experience and salary required.—Box 4556.

REPRESENTATIVES required calling on wholesalers and retailers for most competitive distributors in the trade. Accessories, lamps, fittings and appliances. Only top-rate men with electrical trade connections need apply.—Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.2 (Phone, SHOre-likely, 1882). ditch 8282).

NALES engineers. Young engineers over 21 years required for indoor staff of sales department. Technical and works training in electrical engineering practice, at least to O.N.C. standard, is required by West London engineering and the standard of the sta standard, is required by west London engineering company specialising in explosion-proof and industrial electrical control gear as well as other electrical equipment for industry. Candidates, in replying, should state age, training, qualifications and anticipated remuneration, in con-

SENIOR and junior electrical design engi-DENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, spring and summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.I.

SENIOR resistance welding draughtsmen.

Fully conversant with standard techniques and multi-head design. Scope for initiative. Maximum qualification O.N.C. or equivalent. Junior position also available. Good prospects, superannuation, bonus scheme, canteen. Apply in first instance to the Technical Director, Siemens-Schuckert (Great Britain) Ltd., Great West Road, Brentford, Middx.

OITE foreman required for industrial converses.

OITE foreman required for industrial contract in North of England. Must be fully experienced. Write—W. J. Furse & Co. Ltd., 22, Alie Street, Aldgate, London, E.1. 4529

CTOREKEPER required, only first-class applicants with substantial experience in electrical wholesaling will be considered. More than average salary is offered in return for ability and efficiency. Permanent superannuated post for right man desirous of progress. Canteen available.—Halsev's, Fulham 3355.

Available.—Halsev's. Fulnam 3355.

SUPERVISING engineer required by a large manufacturing company for Birmingham area. Applicants should have experience of industrial installation, including installation of H.T. and L.T. cables, substation work and commissioning of transformers and switchgear. Permanent superannuated post. Write stating age, and giving details of previous experience, to—Box 4474. age, and givin to-Box 4474.

SUPERVISING engineer required for L.V. and 11-kV underground and overhead cable contract work in South Wales, Electricity Board experience desirable. Apply stating age, experience and salary required to—Box 4324.

CUPERVISOR. The man we want must have initiative, ambition and drive. If he is

initiative ambition and drive. If he is also looking to the future he should write to Freeman Electrical Co. (London) Ltd., 253, Whitechapel Road, London, E.1, giving all details

TECHNICAL South representative required Technical representative required to cover Southern Counties and South London to promote sales of electrical instruments and associated equipment. Good connections among electrical and electronic manufacturers an advantage. Details, salary required to—Measuring Instruments (Pullin) Ltd., Winchester Street, Acton, London, W.3. 4498

WORKING foreman required to take charge W ORKING foreman required to take charge of small but expanding electrical repair shop in South-West. Applicant must be used to all types of A.C. and D.C. windings and should be able to attend and affect temporary repairs on site. Salary will be in accordance with qualifications and ability. Whilst the present vacancy is for foreman the successful applicant will be expected to take over management at an early date. Reply in confidence to—Box 7521. TELEPHONE communications engineer for large City (London) office PAX and intercomms. General electrical installation knowledge an advantage. Permanent pensionable position. Age 28/35. All relevant details to Chief Engineer.—Box 4526.

#### APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of these ander this heading. charge under this heading.

#### SITUATIONS WANTED

TECHNICAL SALES ENGINEER. Africa, normally resident Nairobi, keen join manufacturer view post U.K. or overseas; 45, public school, university, workshop and excellent sales record light/heavy electrical plant, domestic appliances, etc. Interviews U.K. appliances, Box 7529.

A DVERTISER desires position with electrical wholesaler or manufacturer, 15 years' sales office experience. London area.—Box 7537. office experience.

.M.I.E.E. (46) desires post with consulting A engineers. Experienced lighting, lifts, switchgear, heating, including floor warming. Sound organiser with searching mind, alive to broad policy yet accurate with detail. Based London but used to travel and long hours when necessary.—Box 7531.

BROTHER of mains engineer to Electricity Board requires position of representative in Lancashire/Cheshire. Recently with B.I.C.

Ltd.—Box 7535.

DEMOTED due to merger, experienced sales representation, office management, etc.
Over 20 years electrical and engineering industries. Aged 38. Resident Leeds.—Box 7519.

D'UE to company merger, domestic engineer and manager urgently seeks similar appointment. Would consider representing in S. Mid'ands and S. Wales areas.—Box 7532.

LEC. engr., cont./exp., design/est./sup./ sales, desires position London or South Coast.—Box 7523.

ELECTRICIAN Wiring fitter-erector seeks Wiring, installing electrical mechanical machines etc. Wide experience and adaptability. Work on own initiative. Conscientious, reliable. Good refs. Age 50.—"W," Alsaa Cottage, Mountnessing. Brentwood.

Mountnessing. Brentwood.

NGINEER (26), H.N.C. (E.ect.), seeks permanent progressive position. Fully conversant with the design and scheming of electro-mechanical control systems, etc. Own car, willing to travel. Basic knowledge of electropics. Indentured apprenticeship.—Box 7527.

WINDING shop manager/foreman, experienced all types rewinds/repairs A.C./
D.C.; production or repair shop, controlling winders, fitters and maintenance engineers, desires supervisory position good prospects.— Box 7539.

#### ARTICLES FOR SALE

#### ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C.. s/p., 50 c., 21-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY 87/89, Sterte Avenue, Poole, Dorset (Tel.: Poole 272)

371, West Green Road, Tottenham, London, N.15 (Tel.: Bowes Park 7080) 19

#### RECTIFIERS FOR SALE

WE have just purchased a number of large Mercury Arc Rectifiers with transformers, etc., from 375 kW to 1.500 kW for 3-phase input and for D.C. outputs up to 600 volts.

THOMAS MITCHELL & SONS LTD.

Edgar Street, Bolton (Phone Bolton 301)

4467

#### WARD LEONARD SETS

All incorporating motor generator sets comprising slipring motors normally 1,440 or 960 r.p.m., with direct coupled generators and excitation equipment, together with A.C. and D.C. control gear.

#### TYPICAL WORK MOTORS

H.P. Maker
0/340 E.E.C.
0/235/225 HARLAND
0/200 W'HOUSE
0/160 CROM.PARK.
0/130/150 M.ET.-VICK.
0/130 L.D.C.
0/100/100 L.D.C.
0/95 ALLEN
0/60/60 ALLEN
0/74 L.S.E.
0/60/60 E.E.C. Voltage Speed
0/480 0/1500
0/250 0/1450/1750
0/230 0/1750
0/480 0/1000
0/500 0/5000
0/200 0/5000
0/220 0/1500
0/220 0/1500
0/220 0/1500
0/230 0/1500
0/230 0/1500
0/230 0/1500
0/480 0/2500
0/480 0/2500

Others available down to 3 h.p. Wide choice of speeds all covered by guarantee.

GEORGE COH Sons & Co. Ltd. COHEN

Wood Lane, London, W.12 (Shepherds Bush 2070) Stanningley, Nr. Leeds (Pudsey 2241)

4377

#### HOUSE SERVICE METERS

200 -240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 28. 6d. carr.

UNIVERSAL ELECTRICAL CO. 221, City Road, London, E.C.1

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI.5105. 67, Rothschild Rd., London W4. 57

A BABCOCK & Wilcox water tube boiler will A BABCOCK & Wilcox water tube bouer win-cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler: also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middles-brough 2622). brough 2622)

Church Street, Middlesbrough (1el. Middlesbrough 2622).

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane. Stammore. Middx. (Edgware 5566/9). 91

A LTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road. London, S.W.18 (VAN. 5234). 151

A LTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

B ARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355.

D ILLIARD Meters. 1/-, 6d, or 1d. slot. All time settings. From 170/-. See Quarterly.—Tradex. Surbiton.

C ABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5).

CABLE, underground. PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock vists.—Batt Electrical Co., 6, Dock Street, London. E. (Tel. ROYal 5905).

CIRCUIT breakers, various sizes in stock.—A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26. Britannia Walk, London, N. 1.

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All vypes up to 100 kW.—Powerco Ltd., 312, York Rd. London. S.W.18 (VAN. 5234).

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26. Britannia Walk, London, N. 1.

D IESEL generating sets, all sizes to 500 kW.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N. 1. .C. and D.C. 1/- slotmeters. Guaranteed 2

DIESEL generating sets, all sizes to 500 kW.
Britannia Mfg. Co. Ltd., Britannia Walk.

LECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.I (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

LECTRIC motors and generating equipment.—E. M. Tatton & Co. Ltd., Kew Bridge, Brentford (ISLeworth 4534/5). 116

LECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2).

LECTRIC motors, generators, motor generators ests, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

LECTRICIANS. Send for details Shaftest bury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for mmediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builderstype ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4).

IT LUORESCENT tubes reconditioned and yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Olive Street, Bury (Telephone, Bolton 7251).

TOR sale, good, unused and used machinery, including electric motors, A.C. and D.C., dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switch-gear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. He

#### COMMUTATOR MOTORS 400/440/3/50

H.P. Make 67.5/270 B.T.H. 35/70 B.T.H. 20/40 B.T.H. 20/40 B.T.H. 1.5/5 L.S.E. .3/8 L.S.E. Speed Rems 95/370 Schrage 850/1300 Schrage 800/1000 Schrage 45/90 Geared 900/3000 Ind.Reg 300/3000 Ind.Reg Remarks Ind.Reg.Control Ind.Reg.Control

#### 400 CPS ALTERNATORS

New, 5 kVA, 115/200 volts-3-400 cps, dual voltage (delta/star) sinusoidal wave for, 3,000 r.p.m. Rectifier excited with A.V.R. Ex stock. Other sizes up to 40 kVA for short

GEORGE COHEN Sons & Co. Ltd. Wood Lane, London, W.12 (Shepherds Bush 2070) Stanningley, Nr. Leeds

(Pudsey 2241)

4376

#### Articles for Sale (continued)

NAMEPLATES, engraving, diesinking, sten-cils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry.

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.I.

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.I.

DOLYPHASE kilowatt hour meters Available

Polyphase kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40
PREPAYMENT 1s. slot house service meters.
—Universal Electrical, 217-221, City Road, London, E.C.1. 36

DURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9).

QUARTERLY credit meters, single and polyphase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes; enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1.

24 CIMALL BR screws and nuts in steel, brass

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screw & Repetition Co. Ltd., Woodgate,

Leicester.

Tellevision slotmeters and time switches.
Details from: Tradex Meter Co., Surbiton (Eimbridge 2234/5/6).

TIME switches, timers and contactors from stock. Lists from J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tell HOP 2750)

Thomas Street, London Bridge, London, S.E.1 (Tel, HOP 2759).

TWO Westinghouse static phase converters for sale. Input 400/440 or 200/250 volts, 50 cycles, single-phase. Output 400/440 volts, 4 kVA, 3-phase, with Dubilier type APF4 capacitor, 15,000 volts peak surge.—F. J. Edwards Limited, 359, Euston Road, London, N.W.I, or 41, Water St., Birmingham, 3. 4499

WENNER time switches, 200-240 v., A.C./ D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.I. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-36, Britannia Walk, London, N.I. (Tel. Clerkenwell 5512)

Clerkenwell 5512).

2-speed motor, 40/20 h.p., 950/480 r.p.m.,
T.E.F.C. slipring type by L.D.C. with Igranic automatic control panel. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park.

78

180 -h.p., 970-r.p.m. T.E.F.C. slipring motor by Lancashire, 400 v., 3-phase, 50 cycles, complete with fully automatic starting panel. Further details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park.

Park.

400 -cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.I. 27

500 -kW, 220-volt Met.-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.I. 17

500 /625-kW L.D.C. generator, 240 volts, 2,080/2,600 amps., D.C., compound interpole with single bearing for direct coupling at 1,000 r.p.m., or on combination bed with new L.D.C. slipring motors, 900 h.p., 990 r.p.m., 3.3 kV or 6.6 kV, complete with switchgear, in approximately six months. Also duplicate generator and spare armature. Further details from Dynamo & Motor Repairs Ltd., North End Road, Wembley.

#### EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401).

CLASSIFIED ADVERTISEMENTS ARE PREPAID

#### ARTICLES WANTED

#### WANTED

D.C./A.C. Motors, Transformers, Cables and all redundant Power Station Plant wanted for dismantling.

ASK US TO QUOTE

B. M. T. CO. LTD. London Road, Barking (RIP. 3387/3715)

298

A.C./D.C. electric motors, generators, trans-A formers, disused stocks of cable, power houses bought and dismantled.—Samuel Hyams, 129, Lambs Lane, Rainham, Essex (Rainham 4896).

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388).

MERCURY (Quicksilver) wanted. Write for packing instructions, Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963).

OUICKSILVER and beryllium copper scrap

OUICKSILVER and beryllium copper scrap urgently required, best prices, prompt cash. Sterling Products Ltd. Edmonton 4541 PBX. 293 CILICON steel offcuts required.—Box 138.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.I.

WANTED for prompt cash, ferrous and nonferrous scrap, also plant for dismantling.
Buyers of secondhand machinery and plant for
re-use.—W. & H. Cooper Ltd., 176, Brady St.,
Bethnal Green, London, E.I.

WANTED, rotary converters, any sizes.—
Universal, 221 City Rd., London E.C.I. 35

WANTED, small ex-W.D. generators, type
UO, ref. 5U/2362, 3,000 w. D.C. and
1,200 watts A.C.—Box 4298.

WANTED, surplus stock cable, all types

I,200 watts A.C.—Box 4298.

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WANTED, 20/25-kW contact type rectifier unit suitable for a 440 volts, 3-phase, 50 cycles supply, with output approximately 480 volts, 2-wire d.c.—Box 4379.

WANTED, 100/130-kVA welding transformer, complete with chokes and suitable for a 440 volts, 3-phase, 50 cycles supply.—Box 4380.

#### AGENCIES

BRITISH agents having large ramifications within the electrical field seek additional agencies from Continental manufacturers of electrical accessories, small domestic electric appliances, etc. Substantial references and ample finance available.—Box 119.

#### WORK WANTED AND OFFERED

WINDING CAPACITY AVAILABLE. TRANSFORMERS, COILS, RESISTANCES — ANY QUANTITY. ALSO EXPERIMENTAL WORK UNDERTAKEN.

W. L. R. S. LIMITED
Delta House, Fauconberg Rd., London, W.4

#### SUB-CONTRACTS WANTED

LIGHT AND HEAVY INDUSTRIAL INSTALLATIONS LABOUR ONLY

Write:—
D. JOHNSON BROS. D. JOHNSON BASS. 37, Priscilla Road, Bow, London, E.3

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. and D.C. motor rewinds and repairs.

ROGRAVED nameplates and labels in all materials.—A. T. Brown & Co. Ltd., 347-349, Katherine Road, Forest Gate, London, E.7 (Tel. Grangewood 1024).

METALWORK. All types cabinets, chassis, write—Dept. 'S,' Philpott's Metal Works Ltd., Chapman Street, Loughborough.

211

DRODUCTION winding of armstures, states.

PRODUCTION winding of armatures, stator, P coils, transformers. Also special motors. Prompt and reliable deliveries.—Lewis Electric Motors Ltd., Moor Wks., Maidenhead, Berks. 194

TRAFFOLYTE labels for switchgear, distribution boards, etc. Prompt deliveries. Competitive prices.—A. E. Cliff & Co., 83, King Street, Fenton, Stoke-on-Trent. 4326

#### PARTNERSHIPS

OLD-established contractor with premises in busy London district offers partnership to experienced electrician. Small premium and assistance to reorganise.—Holborn 8622. 4500

#### EDUCATIONAL

#### U.K.A.E.A.

HARWELL REACTOR SCHOOL

Control and Instrumentation of Reactors Course

THE fifth course on "THE CONTROL AND INSTRUMENTATION OF REACTORS" will be held at Durley Hall, Bournemouth, Hampshire, from the 12th to 23rd September, 1960, inclusive.

The course is intended for those who have a direct interest in the control and instrumentation of nuclear reactors, and it is assumed that participants have some knowledge of the basic principles of these

The fee for the course will be fifty guineas, exclusive of accommodation.

Application forms and further details can be had from :-

The Principal, Reactor School ATOMIC ENERGY RESEARCH ESTABLISHMENT Harwell, Didcot, Berks

CITY and Guilds (Electrical, etc.) on "No pass—No fee" terms. Over 95% successes. For details of modern courses in all branches of electrical engineering, applied electronics, automation, etc., send for our 148-page handbook—free and post free.—B.I.E.T. (Dept. 122), 29, Wright's Lane, London, W.8.

#### BOOKS, INSTRUCTIONS, ETC.

"TELEVISION Receiving Equipment." By W. T. Cocking, M.I.E.E. The fourth edition of one of the most important British books on television deals in a comprehensive manner with television receiver equipment and gives many precised details and the same television of the same process. manner with television receiver equipment and gives many practical details and much design data. The circuits of a television receiver are split into a number of sections and a separate chapter is devoted to each. Other chapters deal with general principles, the signal, superheterodyne interference problems, special circuits, the aerial, the complete receiver, faults and servicing. 30s. net from leading booksellers. By post 31s. 9d. from Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.I.

TELEVISION Engineering": Volume II:

"TELEVISION Engineering": Volume III:
volume describes the fundamental principles of
video-frequency amplifiers and examines the
factors which limit their performance at the
factors which limit their performan

#### POWER SECURITIES CORPORATION

#### SATISFACTORY RESULTS

#### SIR ANDREW MacTAGGART'S REVIEW

THE Thirty-seventh Annual General Meeting of Power Securities Corporation Limited will be held on 2nd June in London.

The following are extracts from the statement to the shareholders by Sir Andrew McTaggart (Chairman and Managing Director), circulated with the report and accounts for the year ended with the report and accounts for the year ended

The consolidated profit before taxation, after adding the income and deducting expenditure and charges, amounted to £999,468, an increase of approximately £200,000 over the previous 7ea

The amount provided for taxation at £478,458 shows an increase of some £194,000 over the £1958 figure, which is accounted for partly by axation on the increased profit mentioned above and partly by the fact that in 1958 the profits of a foreign subsidiary company did not attract any taxation.

After taxation the profit of £521,010 is approximately the same as in 1958.

Taxation over-provided in previous years of £105,463 is a substantial amount and results mainly from the settlement of Double Taxation Relief claims extending over several years.

The Consolidated Net Profit amounts to £526,473, an increase of £106,041 over that of the previous year.

#### Dividend Recommendations

Dividend Recommendations

In view of these results, which I think can be regarded as satisfactory, your Directors ecommend the payment of a dividend on the Drdinary Shares of 15%. This payment will entitle the Preference Shareholders to a participating dividend of 3% for the year which, with the cumulative dividend of 7%, will for the first time give them their ceiling of 10%.

Deducting the net costs of the dividends paid or recommended to be paid of £214,375, the profit of the year retained in the business mounts to £412,098. The amount brought proward from the previous year's accounts was £637,118, which, together, make a total of £1,049,216. Of this sum £262,500 has been ransferred to General Reserve in the accounts of certain subsidiary companies, leaving £786,716 to be carried forward to next year. There is little to which to call your attention in this Corporation's own Balance Sheet, except the increase in Investments at £255,061, compared with £153,502 in the previous year. This increase is partly accounted for by payments on our investment in the Peace River Power Development Co. Ltd., to which I refer ater, and partly by increases in investments ourchased in the ordinary course of our nusiness.

Turning to the Consolidated Balance Sheet,

Turning to the Consolidated Balance Sheet, froperty and Plant at £2,326,898 shows a recrease of nearly £372,000 from that of the revious year, most of which is accounted for the sale of plant. The sale of our office troperty at 58/60 Cannon Street resulted in profit over book value of £77,459, and this mount has been placed direct to Capital esserve.

The item of Development Expenditure refers a subsidiary company's investment in land f £109,349, which is expected to be of a emporary nature, and the balance of £98,051 epresents an interest in a plastics process, hich we consider most promising. It is inticipated that during the current year a eparate company will be formed to take over the position.

The differences in the other items have

The differences in the other items have risen in the ordinary course of our business, and do not call for special comment.

The Capital and Reserves attributable to the rdinary Capital amount to £5,360,282 comared with £4,870,725 in the previous year, a increase of £489,557, which comprises the mount shown in the Consolidated Profit and 1058 Account as retained in the business 412,098, together with the £77,459 capital rofit mentioned above.

#### Peace River Power Development Co. Ltd.

In my last year's Statement I referred to our association with important Canadian, British and other interests in the formation of the Peace River Power Development Co. Ltd., a company incorporated in British Columbia for the purpose of investigating the power potentialities of the Peace River in that Province.

tialities of the Peace River in that Province.

Since then, the Peace River Power Development Co. Ltd. has completed its investigations, and in December, 1959, duly filed with the British Columbia Government its report on the proposed hydro-electric project, etc., for the utilisation of water power potential of the Peace River. In his report dated 25th March, 1960, Mr. A. F. Paget, the Comptroller of Water Rights, stated "I find the proposed development entirely feasible from an engineering standpoint, and approve its overall outline." He also stated that the scheme appears to provide for the maximum economic development of the Peace River potential upstream from Hudson Hope, B.C.

In a covering letter forwarding Mr. Paget's

In a covering letter forwarding Mr. Paget's report to the Peace River Power Development Co. Ltd., Mr. Ray Williston, Minister of Lands and Forests, stated "The Government accepts the findings of the Comptroller of Water Rights, and your Company is now in a position to make the necessary applications, first to the Public Utilities Commission, and then to the Water Rights Branch for the required certificate and licence." and licence.'

There are, of course, further points for consideration, but now that the British Columbia Government has accepted the findings of the Comptroller of Water Rights, the Peace River Company is in a position to make the necessary application to the Public Utilities Commission and the Water Rights Branch for the required certificate and licence.

We have undertaken to subscribe for further

We have undertaken to subscribe for further shares in the Peace River Company

#### International Power & Engineering Consultants Ltd.

Consultants Ltd.

Our associated company, International Power & Engineering Consultants Ltd., formerly B.C. and B.B. Power Consultants Ltd., are consultants to the Peace River Company, and the executives and staff of the company must feel that all their efforts have been worth while now that the scheme has been the subject of such a favourable report, which reflects great credit on all those intimately responsible.

The change of name of the company was decided upon to indicate its wider sphere of operation. By agreement between the shareholders, Balfour, Beatty & Co. Ltd., and British Columbia Power Corporation Ltd., the company has taken over as from 1st April last certain work previously being carried out by our subsidiary company, Balfour, Beatty & Co. Ltd., and also by B.C. Engineering, and will operate in a wider field of consulting engineering.

#### Balfour, Beatty & Co. Ltd.

Work dealt with in 1959 has been both varied work dealt with in 1959 has been own varied and interesting. As mentioned in my last statement, the brochure giving a short history of Balfour Beatty since its formation in 1909 was sent to shareholders towards the end of last year and letters received indicate that it was found to be of considerable interest.

#### Electrical Engineering

UNITED KINGDOM:

The Staythorpe "B" Steam Power Station contract for the Central Electricity Generating Board is making excellent progress, the main building for the plant being practically complete. No. 1 120-MW turbine and No. 1 boiler, together with ancillary works, are in the course of erection and should be commissioned this year.

Our transmission line department has been fully occupied and during last year erected in the United Kingdom over 500 miles of E.H.T. lines and about 100 miles of low-tension

Contracts in hand, some of which will not be completed this year, include 263 miles of 275-kV and 188 miles of 132-kV overhead lines as well as a considerable mileage of lower-voltage lines.

#### OVERSEAS:

The design of the mechanical and electrical work on the Burrard Thermal Generating Station of the British Columbia Electric Co. Ltd. is practically complete. From April last, as mentioned earlier, the remaining work is being carried out by International Power & Engineering Consultants Ltd., our associated

Company.

During 1959 we commenced work on contracts awarded to us by the Electricity Corporation of Nigeria. These contracts cover the installation of generating plant and distribution network in eleven small townships and the erection of 30 miles of 66-kV overhead transmission line with the appropriate substations.

#### Civil Engineering

#### UNITED KINGDOM:

UNITED KINGDOM:

In connecton with the Selset Reservoir which we are constructing for the Tees Valley Water Board, I am pleased to say we made better progress last year, and we should complete the contract shortly. The official opening has been scheduled for September next.

Last February the dam had reached a sufficient state of completion to permit impounding water in the reservoir, and it is anticipated that the remaining surface works will be completed by the contract date.

that the remaining surface works will be completed by the contract date.

The main construction work for which we are responsible to the A.E.I.—John Thompson Nuclear Energy Co. Ltd., at Berkeley Nuclear Power Station has been finished well before the programmed completion date, but we are continuing to administer some services required at site until the completion of the station which is scheduled in 1961.

#### OVERSEAS:

The Mishkab Regulator Contract in Iraq has been completed according to programme, but the results have been adversely affected by labour conditions on site. The labour position is now somewhat improved, and we have received orders for additional work on the contract, which should be completed by August next.

After reviewing the year's operations of other subsidiary companies, the statement continues:

#### Future Prospects

Having left behind some "dead wood," which had to be disposed of satisfactorily, we look forward confidently to an ever-increasing field of development. With a new office building housing all the London Staff of this Company, and of Balfour Beatty, which has been spread over six separate buildings for some time, we feel a closer integration will make for higher efficiency and economy.

The overseas markets in the under developed

The overseas markets in the under-developed countries, particularly in the field of power development, for which Balfour Beatty are especially equipped with a highly efficient technical staff, and fifty years of past experience over a very wide field, are of considerable interest to our Corporation.

The position of development calling for

The position of development calling for finance in our Colonies is causing us some concern on account of the lack of security of tenure for a sufficient number of years to guarantee the private investor that at least if he does venture into an investment he will not lose his capital. The return he may get for his venture is a matter of his own assessment and that of his colleagues. If we are to retain our markets, and I suggest this a "must," then the Government will have to give a lead, which so far is lacking, in order to inspire confidence.

A more inspiring lead than that shown in the last Budget is necessary to encourage enterprise, so that we may not only hold the progress we have made as a country during the past few years, but expand it further.

All members of the organisation, both at home

All members of the organisation, both at home and overseas, have given loyal and devoted service and, on behalf of the Board of Directors, I record our sincere appreciation of their efforts.

Company Meetings (continued)

#### ROLLING MILLS LIMITED ENFIELD

#### RESULTS BETTER THAN EXPECTED

#### THE EARL OF VERULAM'S STATEMENT

THE Thirty-sixth Annual General Meeting of Enfield Rolling Mills Limited was held on 18th May at the registered offices of the company at Millmarsh Lane, Brimsdown, Enfield, The Rt. Hon. The Earl of Verulam (Chairman of the Company) presiding.

The Secretary (Mr. B. Powell) read the notice convening the meeting and the report of the auditors.

The following is the Chairman's statement which had been circulated with the report and accounts for the year ended 31st December,

A year ago I stressed that a check to our rate of progress appeared inevitable in 1959, for a number of reasons. The results that we are now able to show are appreciably better than expected. As last year, I comment upon them factory by factory.

The Brimsdown Factories

The Brimsdown Factories

ENFIELD CABLES LIMITED: Our reasons for the purchase of this Company were fully explained in my circular of 14th May, 1959; they were, in the main, defensive. Enfield Cables' trading results in recent years had not been good. On 1st May, 1959, a price war had broken out in the cable industry, with the outcome that prices had fallen to completely uneconomic levels. Our offer for Enfield Cables' shares became unconditional on 12th June, 1959. Immediately thereafter most energetic steps were taken to reduce unnecessary expenditure all round, to combine services common to both were taken to reduce unnecessary expenditure all round, to combine services common to both the Parent Company and Enfield Cables, to obtain a full order book, to widen the range of products manufactured, and to install systems of costing, plant maintenance, marketing, etc., on the same lines as those that the Parent

on the same lines as those that the Parent Company operates.

In my circular of 23rd November, 1959, I described how Enfield Cables proposed to sell its power cable business to Enfield-Standard Power Cables Limited, a new Company in which we retain 50% of the equity. The new Company started trading on 1st January, 1960.

We are very much encouraged by the reception which the Company has met from the whole industry and by the vigour with which the directors of our partners, Standard Telephones and Cables Limited, are working for

its future.

The activities of Enfield Cables which have not been passed over to E-S.P.C. comprise the sale of copper wire, covered conductors, cable accessories, etc., both at home and abroad, as well as the sale of all products (including cables) through its overseas subsidiaries. In addition Enfield Cables will continue to own the land and buildings at Brimsdown, which have been leased to E-S.P.C. In accordance with the terms of the Agreement of Sale between Enfield Cables Ltd. and Enfield-Standard Power Cables Ltd., dated 3181 December. 1959, the appro-Cables Ltd. and Enfield-Standard Power Cables Ltd., dated 31st December, 1959, the appropriate plant and stock was sold to the latter Company; the Consolidated Balance Sheet now before you has been drawn up after these adjustments (which are reflected principally in Trade Investments and Stock) have been made. We expect that Enfield Cables, in its restricted field, will operate profitably in future.

ENFIELD COPPER REFINING COMPANY LIMITED: We had another good year in the Copper Refinery, with no special problems that I need mention.

Sales of Encon continuously-cast bronze again increased and, at the end of the year, the extension of this plant was under active review.

the extension of this plant was under active review.

The Electrodes Department had another good year. The incorporation of Enfield Cables' Cable Accessories Works at Tottenham into E.R.M. will still further enable us to improve on our production and sales service.

COPPER ROD MILL: As I said twelve months ago, our Rod Mill was experiencing a lower demand at the time than for many years, due to re-grouping amongst our former customers in the electric cable industry. Uncertainty regarding possible export sales

delayed our giving effect to a decision to install extensive further mechanisation. This work was accordingly only started in April, but was carried through very smoothly. In the result we are now able to produce either very large tonnages of rod from the mill in its previous form or much smaller tonnages in its modified form, at approximately equal labour cost per ton in either condition. Domestic demand has improved over the year and, with some revival in the export field, we ended the year at a very satisfactory level.

DRAWING MILL: The transference of work to the new copper drawing bays was completed during the year, just in time to take advantage of a considerable increase in demand which became apparent in December. Reshuffling of plant and processes on this scale inevitably reduced the department's profit, but it is at present poised to benefit from these changes, at a time when the extra capacity now available seems to be required by our

SHEET MILL: This was another very good SHEET MILL: This was another very good year in which our customers were active in all branches. The motor industry, in particular, reached record levels of demand and we are continuing to make available capacity to meet its tremendous expansion plans for the future.

LONDON ZINC MILLS LIMITED: Another successful year. In certain lines demand grew right up to our productive capacity. Balancing additional plant is being ordered.

ROLLING MILLS MINIUM) LIMITED: The expansion of our sales in 1959, to which I looked forward last year, has materialised and we are again in the process of expanding capacity, to enable Brimsdown and Bradford to meet yet higher demands down and Bradford to meet yet higher demands in the future. Important expansions were also made during the year, including the concentration of the whole of our impact extrusion plant in a new factory at Brimsdown.

Further important additions to our rolling capacity have been completed and some reallocation of plant between Brimsdown and Bradford is going on, to reduce unnecessary transport between the two works.

#### Other Factories

Other Factories

THE ASTON CHAIN & HOOK COMPANY LIMITED: Demand from the motor
industry has been at record levels. The new
Brass Strip Mill was completed, nearly on
schedule. Teething problems, inevitable with
such plant, occupied several months. Raw
material supplies to the mill have been difficult.
Plans due to mature early in 1960 should overcome both these problems.
Aston Chain & Hook's subsidiary company,
Carridine & Miles Ltd., who previously occupied
leasehold property, were moved into the main
works at Birmingham during the year. This
will lead to economies and greater efficiency in
the future.

the future.

the future.

BARKER & ALLEN LIMITED: With its subsidiaries, Barker & Allen Ltd. became part of the Group in May, 1959, on terms which were set out in my letter dated 14th April, 1959, to stockholders. The business is complementary to that of the Parent Company, with only a very small area of overlapping. The integration of Barker & Allen Ltd., therefore, with the Parent Company presented few difficulties. Barker & Allen had a very successful year, in line with their results of recent years, but the figures incorporated in our accounts cover less than a full year. Considerable work has proceeded, and is in hand, on plant and process rearrangement. This will result in greater economy, through fewer manufacturing units and less inter-factory transport.

ENFIELD ZINC PRODUCTS LIMITED: ENFIELD ZINC PRODUCTS LIMITED: The rate of decline in demand for zinc cans has not accelerated, though the absolute level is not good. Export prices fell even further during the year, but seem now to be improving slightly, as our foreign competitors become

aware that we are not going to be forced out of any market.

Production space at our Tottenham factory, no longer required for zinc cans, is being made available to other parts of our Group for profit-

HOLLOWAY METAL ROOFS LIMITED: A very active year with a much better order book at the end of the year than at the beginning. Demand seems to be very good at the

moment.

W. E. MARTIN & COMPANY LIMITED:
This business has had its best year, so far, with a very high level of activity, particularly in the field of domestic equipment. Mr. F. Boardman, one of the original directors of the Company, has continued with us since we purchased the business and has retired, at his own request, early in 1960.

WATLIFF COMPANY LIMITED: This Company has had a much better year than 1958. Developments in the Outer Seven Free Trade Area will need very close watching. An intensive study of foreign costs and prices, compared with our own, is under way.

Copper

Copper

The prices at the start and end of the year, which I normally report, were £220 and £255 per ton. During the year a low point of £209 was reached and a high of £266. As nearly the whole of the American copper producing industry and many of the American refiners were strike bound for half the year, these fluctuations were of very much smaller amplitude than might have been expected. The backwardation on the London Metal Exchange reappeared, as a result of stocks on the Exchange being reduced. This, obviously, poses a very awkward question for us, in that covering of the risk on our stocks becomes almost prohibitively expensive. Consequently we are bound to run greater risks under these circum-

ing of the risk on our stocks becomes almost prohibitively expensive. Consequently we are bound to run greater risks under these circumstances than we would like.

Discussions for a basis, other than the L.M.E., for pricing copper on contract, to which I referred last year, have continued. No new basis has been so far found which would meet the practical difficulties of both miner and fabricator.

fabricator.

Restrictive Trade Practices
The effects of the Restrictive Trade Practices The effects of the Restrictive Trade Fractices Act, 1956, have become increasingly apparent during the year. I have already referred to the price war that has developed in the electric cable field. As a direct consequence of the Act, larger and yet larger groups have been formed, within the British cable industry. Each within itself can exercise its own monopolistic that the development of the competitions is smaller, the tendency towards collaborative action in research and development (a notable action in research and development (a notable feature of the industry in the past) must surely diminish. These are logical consequences of the Government's action, but not perhaps the consequences they intended. For these same reasons the impact of the industry on export markets will tend to be less, an inevitable consequence which will rejoice the hearts of our competitors abroad. our competitors abroad.

Appreciation

Appreciation

The Group now employs a total of some 4,500 people in Britain, and an appreciable further number, directly or indirectly, overseas. They have had a hard year, with many changes, but it has also been a year of achievement, and for that I know you would wish me to express to them your thanks. Our managers, our technical and sales staffs, and all in positions of authority, have likewise had a very busy year, and on your behalf I should like to thank them warmly too. them warmly too.

Prospects

We have begun 1960, so far, with an even better level of demand than in 1959. I therefore remain confident that we shall secure at least the same share of future business as we have been doing in the past. As each year passes the results of our efforts have been not only to broaden the basis of our operations but also to found them more securely. Given stable conditions, and arising from them the continued prosperity of our customers, I continue to view the future with confidence.

The report and accounts were adopted and a final dividend of 12½%, making 15% for the year, was approved.

The retiring directors, Mr. F. George Allen, Mr. B. Powell, Mr. N. I. Bond-Williams and Mr. L. E. Dyer, were re-elected, and the remuneration of the auditors, Messrs. Wilkinson & Mellor, having been fixed, the proceedings terminated.

## **Transformers** Sturdy

ROM 500 VA TO 200 kVA

EGULARLY UPPLIED TO NATIONAL COAL OARD, CENTRAL

LECTRICITY GENERATING OARD, AND MANY OTHER LARGE NDUSTRIAL UNDERTAKINGS

Typical 200 kVA Transformer

ALSO

## Power Transductors

FOR FINGER-TIP MANUAL OR AUTOMATIC CONTROL OF POWER UP TO 500 kVA

Sturdy

ELECTRIC CO. LTD. HAMSTERLEY COLLIERY NEW CASTLE-UPON-TYNE

HONE: ENCHESTER 271/2

TELEGRAMS: STURDITRAN, NEWCASTLE-UPON-TYNE

#### A.C. SOLENOID TYPE SBM/T

Now fitted with stainless steel guides-six times the life



Continuous 3<sup>3</sup>/<sub>4</sub> lbs. at 1" Instantaneous at 16 lbs. Smaller sizes available Also transformers to 7 kVA

#### WEBBER

8 FOREST ROAD, KINGSWOOD, BRISTOL

PHONE 67-4065



## MIDLAND

Siddons Factory Estate, Howard Street, Hilltop West Bromwich, Staffs. Phone: WEDNESBURY 1489

Gravity and Pressure Diecastings of PRECISION

QUALITY and DISTINCTION In Aluminium and Zinc Base Alloys

## NASM

**New and Secondhand Machinery** Organisation, Great Britain.

- \* HIGH QUALITY secondhand and nearly new machines of all descriptions.
- **EX GOVERNMENT surplus equipment new** or nearly new.
- ★ DIESEL GENERATING PLANT.
- MANY MACHINE TOOLS such as lathes, drilling, planing, automatics, guillotines, boring machines, etc., in stock, and all equipment carries NASMO guarantee of serviceability.
  - Live agents required in most countries.

#### NASMO (MACHINERY) LTD.

RULL LANE. WEST BROMWICH, ENGLAND



A.E.I. Lamp & Lighting Co. Ltd.	Enfield Rolling Mills Ltd. (Company
Cover 4	
A.F.S. Developments 30	
Adcola Products Ltd 28	Engel & Gibbs Ltd 49
Allied Ironfounders Ltd 21	
Aluminium Wire & Cable Co. Ltd. 13	Equipment & Services Ltd 10
Amber Oils Ltd 108	
Armorduct Cable Co. Ltd 113	
Arrow Electric Switches Ltd 59	
Asquith Electrics (Colne) Ltd 84	Fenton Powen & Co Tital
Associated Electrical Industries Ltd.	Ferranti Ltd
5, 66, 74, 75 & 78	Fry's Metal Foundries Ltd 39
Atlas Lighting Ltd	
Atlas Lighting Litt	ruise, W. J., & Co. Low
Barber & Colman T.td 96	General Electric Co. Ltd 85
Transfer of Committee Printers	Concerns Indiana
	Gosheron, John, & Co. Boar
Barries Electrical Agencies Ltd 56	Citato Zirai illinii
Belling & Co. Ltd	TAA 86
Benjamin Electric Ltd Cover 2	Ltd 86
Birch, H. A., & Co. Ltd 56	
Birmingham Mica Co. Ltd 38	
Bray, E. N., Ltd 63	
Brentford Transformers Ltd 73	Henley Burrowes & Co. Ltd 102
Bridge, David, & Co. Ltd 34	
British Dairy Farmers' Association 63	
British Insulated Callender's Cables	Hildick & Hildick 130
Ltd 15	
Brook Motors Ltd Cover 1	Ilford Ltd 10
Bruce Peebles & Co. Ltd 106	Industrial Tapes Ltd 100
Brush Electrical Eng. Co. Ltd 25	Andrew Mary Mary 1777
Brush Electrical Eng. Co. Ltd 25 Bullers Ltd 2	Keyswitch Co
Bullfinch (Gas Equipment) Ltd 55	Reyswitch Co
	Lancashire Dynamo & Crypto Ltd. 72
Cableform Ltd 33	
Carr, James W., & Co. Ltd 102	
Cementation Group 20	
Channel Conduits Ltd 64	Litholite Insulators & St. Albans Mouldings Ltd. 99
City Electrical Co	
Collins Electrical Ltd	Londex Ltd
Contactum Ltd	London Electric Firm Ltd 30
Craig & Derricott Ltd	London Electric Wire Co. & Smiths
Cressall Mfg. Co. Ltd. 84	Ltd 29
Cryselco Ltd. 23	Long & Crawford Ltd 24
Cuxson, Gerrard & Co. Ltd. 84	Low Moor Alloy Steelworks Ltd 35
Curson, Gentatu & Co. Doc 64	
The state of the s	M K Electric Ltd 44
Daly (Condensers) Ltd 16	Manganese Bronze & Brass Co. Ltd. 62
Docker, John, & Co. (Engineers)	Manifold Electric Co. Ltd 114
Ltd 130	Mason & Morton Ltd 100
Donovan Electrical Co. Ltd 48	Measuring Instruments (Pullin) Ltd. 98
Drayton Southern Ltd 76	Mercury Switch Mfg. Co. Ltd 102
	Mersey Cable Works Ltd 89
Eagle Star Insurance Co. Ltd 112	Metway Electrical Industries Ltd.
East London Mica Works 64	99 & 112
Electric Depôt Ltd 112	Micanite & Insulators Co. Ltd 97
Elliott Bros. (London) Ltd 110	Microcell Ltd. 105
Ellison, Geo., Ltd	Midfand Dynamo Co. Ltd 34
Empire Rubber Co	Midland Fleetric Mer Co Itd 70

Midland Metallics Ltd 129	Sims, F. D., Ltd 96
Mole, M., & Son Ltd 104	Smith Meters Ltd 94
Mudio's Electrical Co. Itd. 19	Smith & Nephew Ltd 22
Mudie's Electrical Co. Ltd 19	
Nasmo (Machinery) Ltd 129	
Newman Industries Ltd 17 & 18	Standard Telephones & Cables Ltd. 58
Etchinoli Interession	Stanley Palmer, G. A., Ltd 83
Oliver Pell Control Ltd 45	Stockfield Mfg. Co. Ltd 28
OHVEL TEH COMMING THE	Sturdy Electric Co. Ltd 129
100	
Palnut Co. Ltd. 102 Parmiter Hope & Sugden Ltd. 80	Suffolk Iron Foundry (1920) Ltd 50
Parsons, C. A., & Co. Ltd 32	Taylor Tunnicliff & Co. Ltd 7
Pirelli-General Cable Works Ltd 47	Techna (Sales) Ltd 27
Pitman, Sir Isaac, & Sons Ltd 96	Telegraph Condenser Co. Ltd 93
	Termination Equipment Co. Ltd 99
	Thew, Edward H., Ltd 82
Power Securities Corporation Ltd.	
(Company Meeting) 127	Transformer & Electrical Co. Ltd 63
Pritchett & Gold & E.P.S. Co.	Tullis, Russell & Co. Ltd 92
T.td. 81	Turnock, Geo., Ltd 112
Ltd	
I dillit, Iv. D., & Co. Louis	Universal Electrical Co 130
D 1 100 TO C (D1-1-1-1-744 314	Utilities (London) Ltd
Ratcliffe, F. S. (Rochdale) Ltd 114	Others (London) Dut
Reed Corrugated Cases Ltd 60 & 61	
Reyrolle, A., & Co. Ltd 14	Varilectric Ltd
Robinson, D., & Co 56	Viscose Development Co. Ltd 110
Rowlands Electrical Accessories Ltd. 95	Volex Electrical Products Ltd 108
Ruberoid Co. Ltd 27	
Runbaken Electrical Products 112	Watson, R. & W., Ltd 102
Lumbaken Edecoracut Lucaucus	Webber, R. A., Ltd
7 1 7 7 1 C- 10-	
S & D Rivet Co 16	
Salford Electrical Instruments Ltd. 57	Westinghouse Brake & Signal Co.
Salter, Geo., & Co. Ltd 8	Ltd 26
Sangamo Weston Ltd 68	Whitecross Co. Ltd 104
Sax. Julius, & Co. Ltd 107	Woden Transformer Co. Ltd 114
Service Electric Co. Ltd 77	Wootton & Co. Ltd 19
Shell Chemical Co. Ltd	Wright Electric Motors (Halifax)
Shell-Mex & B.P. Ltd 70 & 71	
	Ltd 92
Simmonds & Stokes (Niphan) Ltd. 129	
Simplex Electric Co. Ltd 69, 90 & 91	Zenith Electric Co. Ltd 77
*****************************	***************************************

Advertisement copy and blocks for printing in black and white should reach us 16 days preceding date of issue addressed to Electrical Review, Dorset House, Stamford Street, London, S.E.1

## HOUSE SERVICE METERS

Credit Pattern
and Prepayment Type
200-240 v. A.C. S/Ph 50c. (& D.C.)
AVAILABLE FROM STOCK
POLYPHASE 400-440 v. 3-wire Type
Ex Stock

UNIVERSAL ELECTRICAL CO. 217-221 City Road, London, E.C.1



JOHN DOCKER & Co. (ENGINEERS) Ltd.

CABLE MAKING MACHINERY

BUNCHING & TWINNING M/CS.

STRANDING & LAYING-UP MICS.

PAY-OFF & TAKE UP STANDS

SPIRAL MARKING MACHINES

EXTRUDING SCREWS

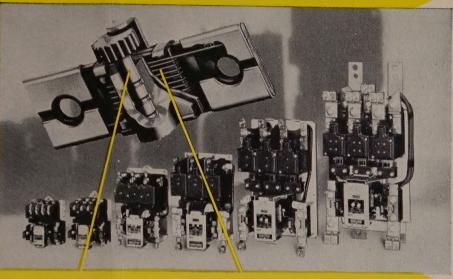
CROMWELL WORKS
NORTH FELTHAM TRADING ESTATE
FELTHAM, MIDDLESEX. TEL.: FELTHAM 6341/3



When you buy Motor Starters - -

## YOU PAY FOR OVERLOAD PROTECTION

## BE SURE CI



**Heat-responsive element** (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection.

Only with ONE-PIECE construction can you know you've installed the heater correctly. Only with ONE-PIECE construction can you know the heater is exactly centred, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you know your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you know your motors have full protection.

Only Square D has ONE-PIECE Construction. ONE-PIECE construction eliminates any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are individually calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on square D starters with melting alloy thermal overload relays

## LET US PROVE IT!

Let your Square D Field Engineer show you 1 how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots — 2 a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.



LEADERS IN CONTROL GEAR FOR OVER 50 YEARS.

EC & M Heavy Industry Electrical Equipment . . . Now a part of the Square D line





CHENEY MANOR SWINDON WILTSHIRE

Square D products are stocked by leading electrical wholesalers throughout Great Britain.

## YOUR CUSTOMERS PREFER Mazda Netabulb

Extensive product tests have shown that four out of five housewives like Mazda Netabulb for appearance and light in preference to an ordinary shape bulb. So keep up your Netabulb stocks—get *your* share of the profits from such a popular line!

Melton Road, Leicester

